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# Evidence for Children's Use of Social Cues to Determine Credibility in Early 2-Year-Olds

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# Evidence for Children's Use of Social Cues to Determine Credibility in Early 2-Year-Olds

**by**

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# Dedication

This dissertation is dedicated to my family, my friends, and my dog.

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# Evidence for Children's Use of Social Cues to Determine Credibility in Early 2-Year-Olds

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Children's confidence in their own knowledge and their understanding of other's intentions may influence their willingness to learn novel information from others. Two studies investigated whether 24-month-old children take into account these different sources of information when learning novel labels. In Study 1, children interacted with a speaker who referred to familiar objects in either a knowledgeable (e.g., the speaker confidently stated, "I know what that is") or an ignorant manner (e.g., the speaker doubtfully stated, "I don't know what that is."). The previously knowledgeable or ignorant speaker then provided a novel label for either a novel or a familiar object. Children were less willing to apply a novel label to a familiar object from a speaker who previously had expressed ignorance than one who previously had expressed confidence in his/her knowledge of object labels. In contrast, when objects were novel, children were equally willing to learn a novel label regardless of the level of knowledge portrayed by the speaker.

In Study 2, children interacted with a speaker who provided either accurate or inaccurate labels for familiar objects in a manner that expressed uncertainty about the information being offered (e.g., "I think that's a …"). Children's willingness to accept second labels for familiar objects was examined. Children were equally likely to learn the novel label for a familiar object from the accurate and the inaccurate speaker. In contrast to past findings which present differences in willingness to learn from accurate and inaccurate speakers, children in this study may have taken into account the speaker's lack of confidence when deciding whether to accept or reject the novel information being provided.

Young children are not naïve observers accepting novel label information from any source. They attend to cues about the speaker's level of knowledge by 24 months. They also are capable of comparing their knowledge with the information being presented by an adult speaker and deciding whether to rely on their own knowledge or accept the information being provided. Both reliability cues from the speaker and children's prior knowledge influence their willingness to learn novel information.

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# Chapter 1: Introduction

A woman is walking through downtown New York City, lost. She turns to a stranger walking by and asks, "Can you tell me where Park Avenue is?" The stranger points to the left and responds, "About 4 blocks that way. You can't miss it." She thanks the stranger and heads in the direction he pointed. While an unremarkable event for anyone who has ever been to New York City, this interaction between two adults illustrates many of the assumptions that may aid children during early word learning. The stranger understands that the woman not only wants to know if he "can" tell her the direction of Park Avenue, but that he will actually provide the information she is trying to attain. The woman assumes that the stranger will provide her with accurate information and may also have the assumption that if the stranger does not know where Park Avenue is, he will be upfront about that as well.

While this example, at first glance, does not appear to mimic the daily interactions between adults and children, it is possible to see how the assumptions children make early in development continue throughout the lifespan. One assumption that has been made about children's word learning is that children believe that adults will provide accurate information. During early word learning, children's vocabularies are expanding at an exponential rate. A two-year-old child learns about 5 words a day on average. With all of the input from the environment children are receiving, it seems logical that they are monitoring the sources of new information for reliability. But how is it possible that children are able to keep track of the large amount of information, both linguistic and nonlinguistic, that is present in their environment and use it to their advantage?

This paper will focus on how multiple accounts for early learning may be interrelated with respect to understanding how children interpret the type of knowledge

that a speaker has when learning novel information. By examining speaker reliability, it is possible to study the influence that a speaker's level of information or knowledge has on children's subsequent behavior. Before moving to how children may develop the understanding that speakers generally provide accurate descriptions of the environment, I will present questions that will guide the scope of this dissertation:

1. Does the ability to understand speaker knowledge as an indicator of the credibility of the information source develop from infant's early understanding of referential cues?
2. At what age do children take into account that a speaker may have different states of knowledge (i.e., knowledgeable, ignorant, or unreliable) when determining whether to learn novel information?
3. What insight into speaker reliability can be provided by contradicting the knowledge of the child with novel information provided by a speaker, as in the situation in which a speaker provides a novel label for a familiar object?

Children may use their knowledge about an object to determine whether a speaker is a reliable source of novel information. In situations in which the speaker is unreliable, such as the case that a speaker lacks knowledge about the object or is uncertain about the object's label, children instead may rely on information they have learned from other, more reliable sources. When determining whether a source is credible, children may attend to referential cues that are available from speaker, such as eye gaze, tone of voice, and facial expressions, as well as the verbal phrases provided by the speaker that indicate the level of knowledge the speaker can provide. If these cues to a speaker's reliability indicate that the speaker is a credible source of information, children may be more

willing to learn novel information. In contrast, if the speaker is not credible, children may disregard the novel information and rely on their own prior knowledge, if available.

This dissertation is divided into five sections to address the issues presented above: Nonverbal Intent Cues, Referential Intent Cues and Word Learning, Speaker Reliability, Theory of Mind, and Second Label Learning. Each section provides an overview of the literature within the field that relates to children's understanding of referential intent. This dissertation begins with a discussion of young children's basic understanding that adults offer social-pragmatic cues to provide information about the purpose of their behavior. After reviewing evidence that children may exploit referential cues from their environment to aid in word learning, the topic of children's use of speaker reliability as an influence on novel label learning will be introduced. There have been a growing number of studies that examine the role of speaker accuracy on young children's word learning. The influence of speaker knowledge on children's willingness to apply novel labels may be associated with children's ability to determine the goals or intentions of the speaker. Consequently, I will discuss the relationship between Theory of Mind development and children's early understanding of intentional acts, as well as how Theory of Mind tasks may relate to language development. Children may rely on adults to provide accurate information about unfamiliar objects as an aid during novel word learning.

This paper will also examine the differences between speaker reliability, which is typically discussed in terms of accurate and inaccurate labeling, and ignorance, which includes situations in which a speaker lacks knowledge. These areas present different states of knowledge that children may encounter early in word learning. Finally, this review will conclude with a discussion of second label learning, which provides an opportunity to investigate children's willingness to learn novel names for objects that are

familiar to them. When children are learning a novel label for a novel object, they may be more accepting of information provided by outside sources due to their lack of experience or knowledge about the object being labeled. During second label learning, children have the option either of accepting or rejecting a novel label for a familiar object because they already have a label that applies to that object. This section of the dissertation includes a detailed review of Mutual Exclusivity, a word learning assumption that has been proposed to help children narrow down the number of possible meanings for a referent (Markman, 1990). This dissertation will propose that by investigating constraints on word learning and their relationship to referential cues, such as speaker reliability, a better understanding of children's willingness to learn novel labels as well as their expectations for adult labelers will be attained.

Children benefit from the understanding that individuals have their own mental states and that referential intent cues provide information about the mental states associated with communication goals. Three- to four-year-old children's decisions about whether to accept information may be based upon several characteristics of the speaker(s) such as age, reliability, level of knowledge, and even the number of people who agree with the information provided (Birch, 2005; Birch & Bloom, 2007;Corriveau, Fusaro, & Harris, 2009; Jaswal, 2004; Jaswal & Malone, 2007; Jaswal & Neely, 2006; Koenig, Clément, & Harris, 2004; Koenig & Harris, 2005). The purpose of the research reported here is to investigate how prior knowledge and referential intent interact to influence children's willingness to accept a novel label.

# Chapter 2: Literature Review

## NONVERBAL INTENT CUES

In order to discuss children's understanding of intentionality, it is important to understand what that term refers to in the greater context. A person's intentions include goals and reasons for acting a certain way, and can be very public knowledge, as they can be expressed in eye gaze, body movement, tone of voice, language, and many other social cues that impart knowledge about one person to another. Many of the cues available are in nonverbal contexts that provide information beyond what is present in the speech input.

As adults, we seem to integrate these social cues into our conversations unconsciously (e.g., when talking about a person located on the other side of the room with a person standing close by, one's eye gaze may shift automatically towards the person being referred to) and we receive and process these cues without much effort (e.g., the other person in the conversation now follows the speaker's gaze and, in turn, looks toward the person being referred to). This referential nature of intention allows clarification of subject matter and helps provide clues, other than what is available in speech, towards the message the speaker is attempting to communicate. This section will focus on when children begin to attend to referential cues that are available from other speakers and later will explore the concept that children expect adults to be accurate sources of information about both familiar and novel objects. Children may have the expectation that the information that an adult provides should move both participants closer to achieving the purpose of the interaction; therefore, the information should be accurate and reliable (Tomasello & Carpenter, 2007). Participants require a basic

understanding of the intentions of the other participants to determine whether they are reliable sources of information.

In order to understand how referential cues help children during word learning, it must be established how children's understanding of intention develops. Tomasello, Carpenter, Call, Behne, and Moll (2004) discuss the emergence of intentionality in young infants as an important facet in the development of social understanding. By about 12 to 14 months of age, children are able to participate in activities that require joint attention: that is, both the child and the adult are constructing a common goal, or an understanding of engaging in a shared task, that they will work together to accomplish. By creating a purpose to their interaction, both the child and the adult also create expectations about the role that each participant plays in order to attain this goal. Tomasello et al. state that both the adult and child "establish mutually supportive roles by coordinating and sometimes even planning what each will do as they act together toward a common end, attending to things jointly as they do" (p. 15). Children, at this age, may assume that adults will provide quantitatively more information about how to achieve the goal because adults have more knowledge. If an adult does not help achieve the goal, children must determine the most appropriate response to the adult's behavior, which may require relying on their own knowledge, if available.

One perspective on children's understanding of referential cues is gained by violating their expectations of what should be referred to during an interaction. Children may develop certain beliefs or expectations of how others should act or respond and, on this basis, predict behavior that coincides with these expectations. When an adult behaves in a manner that does not correspond with the child's prediction, the child must reconcile this violation by either forming a new prediction or accounting for the behavior in some other manner (as in, he meant to place the pen on the table, not to have it roll onto the

floor). A child's world is not one in which random acts are occurring all of the time; they are capable of organizing information in a meaningful manner. One area of research has focused on children's ability to determine the goals of others, mainly focusing on what cues children attend to when determining a person's intentions for performing an action.

Young children seem to have an understanding that humans, but not inanimate objects, are capable of acts that involve intention. Meltzoff (1995) examined whether 18-month-old children would recognize that failed actions done by an adult human had an intended result that was not completed. Participants watched as either a human experimenter or a mechanical device attempted 5 different actions but failed to complete the target act. Children were then tested to see if they would complete the target act that the actor had intended to do, or if they would model the failed actions. Children were six times more likely to produce the intended target act after watching a human perform the failed act than after viewing the mechanical device. Meltzoff concluded that children, and adults, do not assign intentional responsibility to inanimate things, as in we do not claim that our computers meant to delete all of the work we had written before it crashed, but that instead inanimate beings are doing what they are programmed to do by laws such as physics. Humans, on the other hand, may have specific reasons for actions, or intentions, that direct the goal of the behaviors being presented. Meltzoff suggested that infants as young as 18 months can understand simple goal directed behavior: "Infants' understanding of intention in action would allow them to make sense of what would otherwise be rather odd behavior on the part of the adult" (p. 847). Children are using their ability to understand the goals of other intentional beings to organize and successfully predict the intended actions of others.

When interacting with others, children attend to social cues being provided to guide their understanding of the interaction. Sodian and Thoermer (2004) examined how

12-month-old infants understand the referential cues of gazing and pointing. Using a habituation paradigm, the authors found that infants would use the experimenter's eye gaze and reaching behavior to predict later behavior. Results also indicated that 12-month-old infants had difficulty interpreting pointing cues as being referential. A study by Desroshers, Morissette, and Ricard (1995) found that 15-month-old infants had a greater understanding of the referential nature of the pointing gesture than 12-month-old infants. The older infants in this study often produced the pointing gesture accompanied with a change in eye gaze towards their mothers with the goal of directing attention towards an object. Children's attention towards social cues that are salient in their environment, such as eye gaze, may develop earlier than symbolic referential cues, such as pointing.

Eye gaze is a referential cue that young children are able to perceive at a relatively early age and it may be one of the earliest cues to the reliability of the person with whom they are interacting. Chow, Poulin-Dubois and Lewis (2008) investigated whether 14-month-old children were sensitive to the reliability of an adult's looking behavior. Children were given a familiarization period in which an experimenter established reliability by either looking for a toy inside a container, finding it and expressing positive affect (reliable looker) or looking in a container, not finding a toy and expressing positive affect (unreliable looker). People do not typically expresses happiness upon finding an empty box, so children should view the unreliable labeler's positive affect as a violation of expectations. During test trials, a target object was placed either in front of a barrier in plain sight of the children or hidden behind a barrier, blocked from the children's view. Children's willingness to follow the eye gaze of the experimenter towards the target object was measured. Children in the reliable looker condition were willing to follow the eye gaze of the experimenter whether the target object was visible to

them or hidden from them. Children in the unreliable looker condition were willing to follow the gaze of the experimenter only when the target object was visible to them, but not when the target object was blocked from their view. Young children are more willing to rely on an adult who has provided referential cues that are consistent with their expectations, and are less likely to trust information presented by an unreliable adult.

One question that remains is whether children will project their predictions of behavior onto people with whom they have no prior experience. A follow-up study was conducted to clarify whether children were making a decision about the reliability of an experimenter or if the continued access to an unreliable looker only extinguished the response pattern to look (i.e., children learned that there is no positive result associated with following the gaze of the unreliable looker and so they discontinued that behavioral response during the test trials). In the second study, children interacted with an unreliable looker during the familiarization trial but during the test trial they interacted with a naïve looker (i.e., a second experimenter who had not established reliability). Chow et al. (2008) concluded that young infants treated a looker who had established a reliable gaze as equally reliable to a naïve looker who had not established either reliable or unreliable looking behavior. The unreliability of the previous experimenter did not influence the children's trust in an unfamiliar experimenter. The authors conclude that 14-month-olds "treat an unfamiliar adult as reliable by default, unless their expectation in violated" (p. 19). This result provides evidence that children are creating assumptions about the reliability of adults at a very early age and are using social cues provided by adults to predict future behavior.

Children are able to attend to nonverbal social cues, such as eye gaze and pointing, before their second birthdays. They are also able to make judgments about the future behavior of the person they are interacting with based upon the reliability of the

referential information being provided by that person. This early attunement into the referential nature of social cues helps children attend to relevant stimuli in their environment and allows them to have successful interactions with others, within which mutual goals can be created and attained. One area of development that has closely examined the relationship between children's ability to attend to social cues and the referential nature of the cues being provided is in regard to early language development.

## REFERENTIAL INTENT CUES AND WORD LEARNING

As children distinguish between multiple possibilities to identify the meaning of a new word, they likely rely both on their preexisting abilities to organize information about labels and referents and on cues that are available from an adult speaker. As adults provide information in labeling contexts, children have to decide whether the information is both relevant and referential. This is a complex process that requires children to understand the relationship of a label to its intended referent as well as the referential nature of adult labeling. Large bodies of research suggest that biases guide word learning (Au & Glusman, 1990; Clark, 1997; Markman, 1990; Mervis, Golinkoff, & Bertrand, 1994) and that social context may influence how children assign labels to referents (Baldwin, 1993; Sabbagh & Baldwin, 2001; Sabbagh, Wdowiak, & Ottaway, 2003), but less is known about how the two interact.

It could be that children have the expectation that adults will provide accurate information that complies with the general consensus, meaning that when an adult calls a strange looking animal with 4 legs and a tail a "dog" that this is also what most other adults will call the same animal. Young children are unfamiliar with many, if not most, of the objects in their environment; therefore, they cannot rely solely on their own knowledge to help them isolate the label for an object. They rely upon others as sources of information and apply the novel information to preexisting knowledge that they may

have. Through this social scaffolding of information (Pratt, Kerig, Cowan, & Cowan, 1988; Wood, Bruner, & Ross, 1976), adults provide the framework for which children can learn more complex information. As children gain experience in language learning, they may become more comfortable with the concept that adults provide reliable information. One issue that is important to address before discussing the influence of speaker reliability on language learning is how children are able to quickly learn word-object relationships.

The age at which children become skilled at learning a novel label has been contested within the field of psychology. Research has focused upon the argument over whether a "vocabulary spurt" exists around the age of 18 months. Schafer and Plunkett (1998) tested infants, ages 12 to 17 months, to determine whether they would be able to rapidly learn a novel word before the "vocabulary spurt." Participants of all ages looked longer towards an image that matched a previously associated novel label than when an entirely novel label that had not been associated with an image was heard. After only six exposures to a novel label, children as young as 12 months have the ability to associate a novel image with a novel word.

Similar results regarding early word learning in infants have been found using real objects. Woodward, Markman, and Fitzsimmons (1994) studied whether children, ages 13 months and 18 months, would learn a novel label for a novel object when the label was provided 9 times during joint attention. Woodward et al. found that by 13 months of age, children could learn a novel label for a novel object after only a limited amount of exposure to the label. Given that 13 months of age is also before the supposed "vocabulary spurt," it is evident that children have the ability at an early age to rapidly learn and apply a novel word to an object for which they do not already have a label.

An aspect of early word learning that has been the focus of a large body of research and theory is reference uncertainty, which is the concept that a label potentially can refer to an infinite number of properties, characteristics, objects, etc. When children hear a novel word, they have to determine the referent of the label from the myriad potential options that are available within their environment. How is it that children decrease reference uncertainty to successfully learn novel labels? Yu, Ballard, and Aslin (2005) argue that sensorimotor cues, such as gaze and body movement, help children narrow down the large number of possible referents for a label. Their research focuses on embodied cognition, which is the attention to sensorimotor cues, such as movement, that may aid in knowledge acquisition. The use of embodied cognition allows for more fluent processing of both verbal and nonverbal cues, such as those that indicate a speaker's intent. In one study, the authors found that adult participants could more easily recognize the referent to a label that was presented in a foreign language, Mandarin Chinese, when provided with intention cues from the speaker, than when presented with audio information alone, or when presented with audio-visual information with no cues to intention (e.g., a video of images from the book of the story being told). Social-pragmatic cues may enable language learners to hone in on the meaning of a word.

Given that children are attending to an adult's pointing gesture as a referential behavior by the age of 15 months (Desrochers et al., 1995), one question is if they are able to incorporate both social cues and verbal labeling to determine the referent for an object. Baldwin, Markman, Bill, Desjardins, Irwin, and Tidball (1996) tested whether children, ages 15 to 20 months, would attend to visual attention cues coinciding with labeling behavior when learning a new word. Participants were placed in one of two conditions: in the coupled condition, an experimenter produced a novel label for the novel toy while interacting with the participant. In the decoupled condition, an

experimenter produced a novel label from behind the screen, while another experimenter silently interacted with the participant. A third experimenter tested novel label comprehension. Baldwin et al. found that 18- to 20-month-old children were successful at learning a novel label when the experimenter maintained joint attention while producing the label but were unsuccessful at establishing the label-object association in the decoupled condition. Children below the age of 18 months did not appear to have established the connection between the label and the object in either condition. Children's ability to interpret referential intent cues may aid in early language learning by helping children attend to the relevant social cues, though this ability may not be fully developed at the beginning of word learning.

The decoupled condition in Baldwin et al.'s (1996) bears many similarities to the situation in which children hear conversations around them that are not directed towards them, such as overheard speech. Akhtar, Jipson, and Callanan (2001) examined whether 2-year-old children were able to associate novel labels with novel objects presented when interacting with the speaker or while watching as the speaker interacted with another individual. Children were equally likely to apply the novel labels to the appropriate novel objects regardless of whether they were directly involved in the labeling interaction or they were observing the labeling interaction. These results suggest that children may not require joint attention with the speaker when learning novel labels, but children in this study were still given the opportunity to observe and attend to the relevant social cues provided by the participants of the interaction. A large percentage of speech in children's environment will be of the type that they overhear, so it is important that they are able to attend to and make appropriate associations given the speech input available.

One question is whether children attend to speech as the only relevant input in their auditory environment. Do children take into account the social-referential context of

the labeling event when learning that verbal labels and nonverbal sounds can apply to a novel object? Campbell and Namy (2003) found that 18-month-olds would learn a label (i.e., "foppick") or a nonverbal sound (i.e., a two-tone beep) applied to a novel object when it was presented by the experimenter while both the experimenter and the child were attending to the same object. They would not, however, learn either the label or the nonverbal sound when it was presented through a baby monitor while the child was examining the target object with the experimenter present. They found similar results with 13-month-olds but the results regarding the 18-month-olds were more consistent and robust. The authors conclude that children are attending to the intentionality of the labeling event more than to the actual label, and find that children are even willing to apply a nonverbal sound as an object label when the referential cues indicate that it is appropriate to do so.

Children often attend to information available from the speaker about the type of knowledge the speaker has when learning new information. Birch and Bloom (2002) investigated whether children, ages 2 to 4 years, would take into account how familiar the experimenter was with an object when applying a proper name. Children interacted with an experimenter who indicated that she was familiar with one object (i.e., "I've played with this dog before") and unfamiliar with another similar object (i.e., "I've never, ever seen that dog before"). The two objects were then hidden and children were either asked a question that included a proper name (i.e., "Where's Jesse?") or a common name (i.e., "Where's the dog?"). Children in all age groups assigned the proper name to the object that the experimenter had indicated was familiar. One unexpected finding was that younger children tended to give both objects to the experimenter in the common name condition. The authors suggest that younger children are including both objects to be sure that they have answered the question correctly and note that children did not respond this

way when using a proper name, which may indicate that they understand that a proper name only applies to a single object. The authors conclude that children's understanding of familiarity is associated with their understanding of the kind of knowledge that others may have and that children can use this information to discern intentions.

Children pay attention to a variety of cues when learning new words, including social cues from the speaker supplying a novel label. Social-pragmatic cues, such as eye gaze, or statements that reflect the speaker's knowledge about the environment, can provide information about a speaker's intentions. Research in word learning and social cues suggests that children can use such cues from adults to determine the referent of a novel label. Can they also use these cues to identify an adult's knowledge and determine whether they should accept novel information from that adult? A growing body of research examines how children take into account speaker reliability when making decisions of whether to trust or discard specific information provided by an adult. Young children's understanding of their own knowledge and their ability to discern the reliability of others' information are important factors affecting their willingness to accept novel information.

## SPEAKER RELIABILITY

Before discussing the role of speaker reliability in word learning paradigms, it is important to clarify the terms that will be used to describe labeling behaviors. An *accurate* labeler is one who consistently provides an appropriate label for a familiar object. An *inaccurate* labeler is one who provides a familiar object with a mismatching or inappropriate label, which generally is a different familiar object's label. Speaker reliability is important to early word learning, and may even aid in learning words before speech production. Koenig and Echols (2003) examined how 16-month-old children responded to intentional cues involving the labeling of familiar objects. Participants saw

a series of color slides that displayed familiar objects. Participants either heard the accurate label for the object (e.g., "That's a cat" when the child was viewing a cat) or an inaccurate label (e.g., "That's a shoe" when the child was viewing a cat) across all trials. The purpose of providing mismatching familiar labels in the inaccurate labeling condition is two-fold: first, the young child should recognize that the label being provided does not match the object. Second, the child should also understand that the mismatched label is not a second label for the familiar object; it is typically a label that applies to a different category of objects. A human speaker who focused visual attention upon the image during the trials provided the label. Infants' eye movements were coded. Infants looked longer at the image being displayed when the human speaker correctly labeled the object. Infants looked longer at the human speaker and towards the parent when the image was incorrectly labeled. This coincides with the prediction that infants expect human speakers to truthfully label, and are surprised upon hearing false labels. Upon hearing false labels, they may look to the speaker for cues about the speaker's intentions. Children are using their knowledge of referential cues to help determine the goals of the speaker who is providing information.

In order to examine the influence of accurate and inaccurate labeling on children's word learning, one must first understand if children recognize that a difference in the labeling behaviors of the speaker exists. Koenig, Clément, and Harris (2004) examined whether 3- and 4-year-old children would attend to the labeling behavior of two speakers, one who is accurate and one who is inaccurate, before presenting the children with novel label learning trials. In this methodology, the children were asked to explicitly indicate whether each of the speakers had provided right or wrong information during a familiarization period. After providing their judgments, children were presented with 3 novel label-learning trials with the same two speakers. Each speaker provided a different

novel label for the same novel object. Children were then asked which label they would use as a referent for the novel object. After the novel label trials, children were again asked to judge the overall accuracy of the two speakers. Koenig et al. found that both 3- and 4-year-old children could identify the labeling ability of both the accurate and inaccurate speaker. But children who could correctly identify the accurate and the inaccurate labeler at both the beginning and the end of the experiment were more likely to rely on the information presented by the accurate labeler during the novel label trials. Children who made errors when identifying the accurate versus inaccurate labeler during the judgment tasks performed below chance levels during the novel label trials. The authors conclude that children who are able to identify and retain information about the accuracy or reliability of a speaker's information are more likely to later rely on the speaker who provided accurate information.

Children's willingness to accept a novel label from a speaker may depend on the overall accuracy of the information being provided. Pasquini, Corriveau, Koenig, and Harris (2007) found that children as young as 3 years of age were taking into account the labeling behavior of a speaker when making decisions as to whether to accept a novel label for a novel object. The authors examined whether a speaker had to be 100% accurate in order to be considered a reliable source of labeling information. They compared the results from children's label choices for novel objects after a speaker had either been 100% accurate or 75% accurate when providing familiar labels to familiar objects. Three-year-old children would accept a novel label if the speaker had been 100% accurate, but not if the speaker was 75% accurate. Four-year-old children were more willing to accept a novel label for a novel object from a speaker who had been 75% accurate. The authors propose that 3-year-olds' performance is based on a binary system of trust: either a speaker is reliable or unreliable. If a speaker provides inaccurate

information, even if it is only one error, this is enough for the 3-year-olds to disregard any future information provided by the speaker. Four-year-olds, on the other hand, may keep track of the frequency of errors, instead of a raw score. This allows them to make decisions based upon overall accuracy, unlike the 3-year-olds. These results indicate that children are monitoring the labeling behavior of the speaker when they have to decide the appropriate label for a novel object, but that older children are more successful at determining credibility.

If young children are constantly monitoring their labeling environment for predictions about accuracy, this might seem to require a conscious effort on the part of the children. However, Pasquini et al. (2007) suggest that young children are using statistical learning to determine which speakers are more reliable. Their model would have children applying a trustworthiness score of zero to adult labelers, meaning that all adult labelers are reliable by default. A score of zero would be consistent with a speaker who is 100% accurate when providing labels. The only way to affect this score is negatively; if a labeler provides inaccurate information about an object, then his/her trustworthiness score will decrease by one error point. The only effect on the reliability of a labeler is a negative effect; otherwise, all adult labelers remain the same regardless of whether or how much they have proven to be accurate sources of information. The authors propose that children's willingness to learn novel information from a speaker is determined by the frequency of errors that the speaker produces. Children keep track of the accuracy of the speaker's information in order to judge their reliability.

Although the assumption that an adult is a reliable source of information may help children organize information more readily, it can also be overcome when other, more salient, information is present. Jaswal (2004) found that 4-year-old children were more likely than 3-year-old children to reject a label for an out-of-category object that had

perceptual features that matched a different label (i.e., a cat-like object being referred to as a "dog"). Four-year-old children were more willing to accept the mismatched label for the out-of-category object when presented with labeling that explicitly acknowledged the mismatch of the label and the perceptual features of the object (i.e., a catlike object is referred to with the following phrase: "You're not going to believe this; but this is actually a dog"). Three-year-old children were willing to accept the mismatched label both with and without the explicit acknowledgement of the mismatching. Jaswal concludes that children are basing their decisions to accept or reject a label for an object by considering the intentionality of the labeler. Four-year-old children are more selective in their willingness to override categorical boundaries when accepting a label while 3-year-old children may rely more heavily on their assumption that adult labelers provide accurate information.

Children may rely on their own knowledge about the world if they have reason to doubt the information provided by either an accurate or an inaccurate labeler. Clément, Koenig, and Harris (2004) had 3- and 4-year-old children participate in an experiment in which their own experience conflicted with the information provided by both accurate and inaccurate labelers. Children interacted with 2 puppets, one that provided reliable labeling information about familiar objects and one that did not. Children were then asked to predict how each puppet would respond when asked about an object the puppets could not see. Children were also asked to choose which puppet they would rely on when they could not see the object being referred to. Only the older children could correctly predict the responses of both the accurate and the inaccurate puppets and correctly identify which puppet would provide accurate information about an unknown object. In the final task, children were presented an object that they could observe as each puppet provided inaccurate information about the object. In this task, even the previously reliable

puppet provided information that did not match the observations of the children. When the testimony of the accurate and inaccurate labeler conflicted with the first-hand observations of both younger and older children, all children were more likely to rely on their own observations than the information provided by the accurate and the inaccurate labeler.

Two explanations were provided to explain the age differences discussed in Clément et al.'s study. One is that the 3-year-old children are operating with the expectation that speakers provide accurate information, while 4-year-old children are more likely to attend to and judge the accuracy of the information provided by each speaker in order to determine whether they are reliable. The other explanation offered relies more heavily on children's ability to understand the mental states of others. Three-year-olds typically fail false belief tasks, which require the understanding that a person other than oneself can have feelings, thoughts, or beliefs that are incorrect. To successfully complete a false belief task, as most 4-year-olds do, one must be able to understand that others have beliefs that are based upon their own knowledge that may not accurately reflect the world. Children of both ages are able to understand that their first hand experiences can provide more reliable information than the testimony of others.

Children also take into account the type of information available to the speaker when determining reliability. A study by Nurmsoo & Robinson (2009) is the only one to date that examines 3- to 4-year-old children's willingness to accept information from previously inaccurate speakers using a paradigm in which children interacted with a single speaker (i.e., a puppet) throughout the procedure. The speaker provided inaccurate information about the properties of objects, but in one condition it was given informed access to make a judgment (i.e., the puppet was able to see the object and was asked to identify the color), whereas in another condition the puppet was given uninformed access

(i.e., the puppet was able to see the object but was asked to identify whether it was hard or soft). Children were given informed access to the objects to allow them to make a judgment about the reliability of the speaker, who was always inaccurate regardless of the type of access granted. Both conditions had identical test trials in which children were asked to make a judgment about a new object with uninformed access, whereas the puppet had informed access to the object and always provided a judgment that contradicted the children's suggestion. Children could either maintain their original suggestion or accept the puppet's judgment about the property of the object. Children who had previously interacted with a puppet that had given inaccurate information after having informed access regarding the properties of objects ignored the puppet's judgment and supported their own suggestion. However, children who had interacted with a puppet that had uninformed access when providing inaccurate information were more likely to support the judgment of the puppet now that it had informed access. This finding suggests that children will excuse previously inaccurate behavior if given a reason, such as uninformed access, to explain the behavior. Children are attending to information available during an interaction about the speaker's reliability that influences their willingness to accept information.

Children attend to personal characteristics of the speaker when determining reliability as well. Jaswal and Neely (2006) examined whether 3- and 4-year-old children were more likely to trust age over reliability. Children participated in one of four conditions: one where both an adult and a child provided different accurate labels for the same objects, one where the adult provided accurate labels but the child did not, one where the child provided accurate labels while the adult did not, and one where both the adult and child provided inaccurate labels. At test in all conditions, both the adult and child provided differing novel labels for the same novel object. Children at both ages

were more likely to rely on the label provided by the adult speaker when the adult had provided accurate information on previous trials. When the adult provided inaccurate information, children were more likely to rely on the child who was providing reliable information. The authors conclude that children often rely on adults for accurate information about labels, but are also willing to take into account previous reliability when choosing whom to trust.

In addition to relying on a speaker's past accuracy record, trust in the speaker can also be determined by how much knowledge a speaker has about a topic. In the previous studies, speakers either provided a label that matched the object being presented or a label that matched a different, but not present, familiar object. However, it is rare for young children to interact with an adult who earnestly and seriously mislabels familiar objects. What is more common is for a child to ask an adult for the label of an object unfamiliar to both, such as the case with a child who has a box full of various dinosaur genera, asking the adult to name each one individually. In this situation the adult, who is ignorant of the label for the object, may provide a verbal cue of his/her ignorance with a phrase like, "I don't know what that is." An *ignorant* labeler is one who denies knowledge about an object or expresses uncertainty about the information being provided during the labeling interaction.

Young children tend to treat inaccurate and ignorant labelers as two very different sources of information. Koenig and Harris (2005) found that 3-year-old children were reluctant to learn a novel label for a novel object from an ignorant labeler, but were willing to learn from an inaccurate labeler. They attribute this difference in trust to 3-year-olds lack of understanding of false belief. Because 3-year-olds fail to recognize that other people can either hold a false belief about an object label or lie about their knowledge of an object and provide an incorrect label, the speaker's reliability does not

influence children's trust in that particular speaker's ability to provide accurate labels. Four-year-old children are less willing to accept labeling information from both ignorant and inaccurate speakers. The authors suggest that the ability to discern whether a speaker is providing accurate information is a developmental function that evolves with the understanding of false belief. As children gain a greater ability to reason about others' thinking, they become more selective in determining which speakers are providing reliable information.

Another interesting finding from the Koenig and Harris (2005) paper relates to what types of decisions children make regarding the reliability of the speaker. Is speaker reliability a global or a local trait? Koenig and Harris suggest that previous studies focused mainly on the reliability of the speaker being a temporary or fleeting trait dependent on the circumstances of the experiment (Povinelli & de Bois, 1992; Robinson & Whitcombe, 2003). Of particular interest is how children will act when speaker reliability is treated as a more global trait, meaning that the reliability of the speaker extends beyond familiarization trials to influence later interactions with the child. They interpret their results from the previously described study to support the theory that children have a "default trust" (p. 1275) that a speaker will be a reliable labeler. When the speaker violates that trust, then children are less likely to rely on that speaker for information. The type of violation of this trust will influence how children will react, depending on the age of the child.

If all speakers by default have a score of zero, meaning they are reliable without proof, and inaccuracy causes a negative score, then what would lack of knowledge or ignorance about an object label cause? Pasquini et al. (2007) claim that every error causes a loss of an error point or a decreasing trust in the reliability of the speaker, but it is not clear how ignorance would be treated according to this model. Do children consider

errors of inaccuracy as being of the same magnitude as lacking knowledge or showing ignorance in regard to an object? In the Koenig and Harris (2005) study, 3-year-old children judged ignorance as either a stronger cue for unreliability or as a more salient cue of unreliability. They were less willing to learn from a speaker who indicated a lack of knowledge about the objects being presented than from a speaker who provided accurate information. A possible confound in the Koenig and Harris study is that the ignorant speaker never provided a label to compete with the accurate speaker's label during the familiarization trials. Children may have learned to rely on the speaker who provided labels, regardless of accuracy, and to ignore the speaker who did not provide information about objects when determining from whom they should learn novel words. The authors acknowledge this point but argue that children were attending to the intention of the speakers when deciding who was more reliable. They support their argument with evidence that 3-year-old children recognized that the ignorant speaker lacked knowledge about labels and therefore, shouldn't be considered a reliable source of information.

In the Koenig and Harris (2005) study, children were presented with 2 speakers who provided information about their reliability during the same trial. Sabbagh, Wdowiak, and Ottaway (2003) investigated whether 3- to 4-year-old children would disregard a novel label for a novel object from an ignorant labeler if a more confident labeler offered an alternative label. Children interacted with either a knowledgeable or an ignorant labeler. The knowledgeable labeler selected an object and said: ""…I know just which one's his *fep*. It's this one." while the ignorant labeler said: "...I don't know what a *fep* is. Hmmm. Maybe, it's this one." Later, a second experimenter entered the room and selected a different toy from the one previously labeled and said: "We've got a *fep*." During test trials, children were asked to indicate which novel object, either the one

labeled by the first or the second experimenter, was the referent for the novel label. Results indicated that children were more likely to select the object labeled by the knowledgeable speaker than by the second experimenter. However, children who interacted with an ignorant speaker were more willing to apply the novel label provided by the second experimenter to the novel object. The authors concluded that children disregard information provided by an ignorant speaker while attending to and learning from more knowledgeable speakers. Children's attention to cues regarding a speaker's knowledge helps make word learning faster and more reliable by allowing them to filter information from reliable and unreliable sources.

Sabbagh et al. (2003) also describe the effect of speaker reliability on children's learning abilities. They argue that being exposed to an ignorant labeler does not have a negative effect on subsequent learning. Children will not apply their predictions about the reliability of an ignorant adult to an unfamiliar adult who has not provided information about reliability. How is it that children in Sabbagh et al.'s study were able to decide whether to apply the label provided by the first or the second experimenter? One possibility that was proposed by Savage and Au (1996) in regards to second label learning was that children will retain more than one label for an object in their memory and decide later which label is more appropriate to apply to an object. In this scenario, children would mark the label provided by the ignorant labeler as being a possible label for an object and, upon hearing a more confident speaker provide a new label for the same object, reject the label provided by the ignorant labeler because it is deemed less appropriate than the new label provided by a confident, seemingly knowledgeable speaker. Children who are presented multiple labels for a single object from two knowledgeable speakers may have to rely on a different strategy, given that both sources of information are confident. Children may choose to interact with the labeler that has

provided more accurate information overall, or the labeler that the child has more experience with, but there have not yet been studies to examine this question. Children may take into account multiple social-pragmatic cues when determining the reliability of a speaker who is providing novel information, which may help children overcome reference uncertainty.

Overt ignorance is one of a cluster of cues that can represent a lack of knowledge; distraction and hesitation are among these cues as well. Jaswal and Malone (2007) examined whether 3-year-old children would learn from speakers who were either confident or ignorant when labeling hybrid objects (i.e., novel objects that have qualities that fit into two distinct categories, such as a carlike object that also has features of a shoe). Children who heard a confident experimenter provide labels were more likely to apply a familiar label to a hybrid object than those who heard an ignorant labeler (i.e., "I think this is a…"). In a second study, the authors manipulated the type of ignorance that the experimenter exemplified using three conditions. In the Ignorant condition, the experimenter mislabeled a familiar object before introducing the hybrid object. The experimenter acknowledged the error in labeling and attributed the mistake to inattentiveness (i.e., "Oops!...Sometimes I don't look at things as carefully as I should."). This cue towards ignorance differs from those used in other studies by providing an excuse for the lack of knowledge (i.e., inattentiveness). In the Distracted condition, the experimenter held the hybrid object while confidently labeling it with a familiar label but the experimenter directed visual attention towards on a box on the floor in which the children could not see the contents. In the Ignorant and Distracted condition, the experimenter mislabeled a familiar object, explained that it was due to inattentiveness, and then directed visual attention to the box on the floor while labeling the hybrid object with a familiar label, as in the Distracted condition. Results indicated the children were

willing to learn the familiar labels when the experimenter was Distracted, less willing when the experimenter was Ignorant, and even less willing when the experimenter was both Ignorant and Distracted. The authors attribute the decreased performance in the Ignorant groups to the excuse the experimenter offered for the mislabeling; children were provided an explanation for the experimenter's unusual behavior and were therefore more skeptical of later labeling.

In a previously discussed study (Koenig & Harris, 2005), 3-year-olds are less influenced by the inaccuracy of the speaker but are influenced by ignorance, unlike 4-year-olds who allow violations of both accuracy and ignorance to influence their trust in the speaker. Sabbagh and Baldwin (2001) investigated whether 3- and 4-year-old children would take into account different types of hesitancy cues when deciding whether to learn from a speaker. First, the authors established that both age groups were willing to learn novel labels for novel objects when a speaker expressed knowledge of the objects but not when a speaker expressed uncertainty. In a follow-up study, the authors varied the types of hesitancy cues that the speaker expressed when applying a novel label to a novel object. The study contained two conditions: children either interacted with an experimenter who had made the toy but was unsure of what to call it or an experimenter who was uncertain about the label because a friend had made the toy. The 4-year-olds were more willing to learn from an experimenter who expressed first-hand knowledge about the toy, even when hesitant about applying a novel label, but would not learn from an experimenter who could not provide confident information about the toy. The 3-year-olds performed poorly on the word learning task in both conditions. The authors conclude that children are going beyond just reasoning about the referential cues that speakers provide, and are taking into account the type of knowledge that the speaker has. They also argue that older children are better able to discern the differences in mental state

knowledge by attending to more sophisticated cues that the speaker is providing, while younger children may be attending to more salient cues, such as hesitancy. The ability to understand social-cues as well as mental state knowledge may help children when deciding whether it is appropriate to learn from an unfamiliar speaker.

Children may have an understanding that social-pragmatic cues provide evidence for the type and extent of knowledge that a speaker has about an object. How is it that children come to attend to these cues? Their reliance on referential cues, such as eye gaze and tone of voice, can only provide a fraction of the information that is necessary to determine a speaker's knowledge state. It is possible that children's understanding of others as individuals with their own distinct knowledge is part of a greater skill set that helps children understand the intentions of others on a more general level. Research on theory of mind has provided insight into how children come to understand that other people provide knowledge that is different from their own knowledge. Children's understanding that a person may provide information that contradicts their present knowledge may generate a greater level of skepticism in the information being provided. Children may take into account the source of the information and determine whether the source is more knowledgeable than they are about the given topic. Children's ability to determine who is a credible source of information becomes more sophisticated as they distinguish between accuracy of their own knowledge and the knowledge of another speaker.

**THEORY OF MIND**

Given that age differences in children's understanding of speaker reliability cues appear similar to those found in typical theory of mind tasks (Clément et al., 2004), one question is how children's understanding of ignorance relates to their successful completion of false belief tasks. Children's understanding of mental states has been

shown to develop in different stages. Hogrefe, Wimmer, and Perner (1986) examined how children would respond to ignorance and false belief questions about the same interaction. Children either participated in a game with another child or heard stories that involved typical false-belief situations (e.g., changing the contents of a box while another child is out of the room) and then asking whether the non-present child would know what was in the box (Ignorance question) and what that child would say was in the box (False Belief question). Over a series of five different experiments, 3- to 6-year-old children were tested on their ability to answer these two different types of questions under different circumstances. Results indicated that 3-year-olds were not as successful at understanding Ignorance questions as 4-year-olds, and that 5- and 6-year-olds were better able to understand False Belief questions than children of younger ages. The authors also found a similar developmental difference in the understanding of more sophisticated Ignorance and False Belief questions in the older age group. Most 4- to 6-year-olds answered the more complicated Ignorance questions correctly but even 6-year-olds found the more complex False Belief questions difficult. The authors conclude that Ignorance is easier for children to understand because it requires a simple judgment on the mental state of a person while False Belief requires additional inferences, such as predicting the behavior of another person, on the part of the child about the knowledge that a person holds.

The ability to understand theory of mind/false belief may have origins in infancy. Wellman, Lopez-Duran, LaBounty, and Hamilton (2008) investigated whether early understanding of intentional acts was associated with later success on theory of mind tasks. They examined 11-month-old infants' attention to actions that were either consistent or inconsistent with the expectation of an intentional action. In the consistent trials, infants watched a person look favorably at one of two objects during habituation.

During the test trial, these infants watched the person hold the object that had been viewed favorably. In the inconsistent habituation trials, infants watched a person view one object favorably but, during the test trials, hold the object that had not been viewed favorably. Infants were later tested on theory of mind tasks at the age of 4 years. Results indicated a positive predictive relationship between infants' attention during the intentional actions and later abilities on false belief tasks, even when factoring out such variables as verbal and performance competence and executive function/IQ. The authors conclude that there is a strong longitudinal relationship between infants' social attention, as measured by their ability to understand intentional actions, and later understanding of mental states and theory of mind.

A similar study investigated the relationship between young children's imitation of intentional actions and later theory of mind abilities. Olineck and Poulin-Dubois (2007) examined whether 14- and 18-month-old children would reproduce actions that an experimenter intended to produce and whether they would imitate actions that an experimenter did not desire or performed accidentally (i.e., "Whoops!"). At the age of 3 years, approximately half of the children who participated in the initial study also completed a series of theory of mind tasks. The authors found that the children who had imitated the intentional action were more successful on the theory of mind tasks. Results also indicated that measures of theory of mind, and specifically the false belief task, are associated with early use of internal state terms. They conclude that there is a link between early understanding of adults as intentional beings and later theory of mind abilities.

It is likely that in addition to an understanding of intention, there is also a relationship between early language abilities and theory of mind. Watson, Painter, and Bornstein (2001) measured 2-year-old children's comprehension and expressive language

as well as maternal reports of child language. At 4 years, children were given a verbal intelligence test as well as a false belief task. The authors found a positive correlation between early language abilities and performance on the false belief task. They conclude that "more advanced features of language might lead to more advanced false-belief understanding later because language underpins the capacity to mark aspects of mind such as perspective, intention, obligation, and degree of certainty" (p. 454). The interplay between language and intention seems to be related to the ability to succeed at theory of mind tasks and the understanding that others have differing knowledge from oneself.

If children are able to attend to intentionality cues by the age of 1 year, why do they have difficulty understanding false belief tasks at the age of 4 years? One possibility is that children's prior knowledge biases their future predictions. Birch (2005) describes this phenomenon as the curse-of-knowledge. In traditional false belief tasks, children are presented a scenario in which they know information that someone else does not. In order to respond correctly on false belief tasks, participants must ignore their knowledge and provide the response that a naïve participant would. Children below the age of 4 years have difficulty responding to questions about the beliefs that another person would have. Birch suggests that once both children and adults have access to information, it then becomes difficult to inhibit that information. Both age groups find questions that involve disregarding prior accurate information to be problematic. Birch also suggests that this curse-of-knowledge bias predicts that children will "have difficulty appreciating another person's perspective when they are knowledgeable, but not when they are ignorant" (p.26). This implies that children may be more willing to understand another person's perspective when they do not have previous information that contradicts it.

But what happens when the children are asked to provide an explanation for why someone is purposefully providing inaccurate information? Three-year-old children were

more willing to rely on the information provided by an unreliable labeler than 4-year-old children (Clément et al., 2004; Koenig & Harris, 2005), but it is unclear how children interpret the intentions of the labeler. Research investigating deception provides the opportunity to examine children's understanding of the interaction between speaker reliability and intentionality. Deception is a situation in which children "have already acquired certain real world knowledge and a speaker's verbal statement is inconsistent with this knowledge, [children] may use this inconsistency to decide not to believe the speaker's statement" (p.1689) (Lee, Cameron, Doucette, & Talwar, 2002). Lee et al. (2002) investigated children's understanding of intentionally misleading statements (e.g., lies) about a fantastical event. Children, ages 3 to 6 years, interacted with an adult confederate who told a story about a fantastical entity (i.e., a ghost). After children left the room, a glass was broken. When children returned to the room, the adult confederate claimed that the ghost from the book had appeared and broken the glass. Three- and 4-year-old children were more willing than 5- and 6-year-old children to believe the confederate's fantastical explanation of the event. By 5 to 6 years of age, children typically identified that the adult was providing false information, and these children were more likely to indicate that the adult was doing so in order to avoid responsibility for an action. The authors conclude that younger children have more difficulty distinguishing between real and fantastical events and therefore, are more likely to agree with an experimenter who provides an implausible excuse for an action than older children. Children's confidence in their own knowledge may influence their willingness to trust information provided by others.

Lee et al.'s (2002) study introduces an interesting topic to the discussion of accuracy and reliability: how do children understand when an adult is purposefully providing information to mislead? They conclude that young children simply do not have

the world knowledge to understand that a fantastical creature is not a plausible actor in a real-world event. Given the review of the literature on children's assumptions regarding speaker reliability, it could also be possible that young children are using the information provided by the adult to confirm their existing knowledge about the possibility that fantastical entities exist. I have discussed children's willingness to learn novel information from reliable adults, and that adults do not have to provide information about the extent of their knowledge in order for children to assume that they are accurate sources of information. It could be that, in the 3- to 4-year-old children's view, the adult experimenter who provides the fantastical excuse for a situation is not purposely misleading them, but instead is providing accurate information that confirms the children's suspicions that fantastical creatures may actually be real. Lee et al. (2002) found that children were more willing to believe the confederate's fantastical explanation if they already had the belief that ghosts may exist in reality. Even if children were uncertain about fantastical entities before the experiment, during the experiment the adult is encouraging a fantastical belief. The 6-year-old children in Lee et al.'s study were less likely to hold fantastical beliefs than the younger children and were also more willing to reject the confederate's fantastical explanation. If children are confident in their knowledge, or their beliefs, they may be less likely to be influenced by a speaker who provides information that does not match their own.

Bergstrom, Moehlmann, and Boyer (2006) suggest young children, when presented with novel information, first accept the information and later evaluate it "in cases where they have sufficient opportunity, motivation, or previous information" (p. 532). They argue that the default behavior for children is to initially believe in the novel information being provided and, upon reflection, choose to reject the information or accept it given that there is no alternative explanation/theory (i.e., children don't have

proof that the Earth doesn't revolve around the Sun, so they accept this as a true statement when taught in Science class). If children have the ability to discredit the information being provided, whether because the source is unreliable or they have knowledge about the topic that contradicts the information being provided, they will choose to disregard the novel information. The next section of this paper will discuss children's willingness to learn a novel label for an object that is familiar to them, typically referred to as second label learning. Given children's existing knowledge about the object being labeled, they have the option to accept or reject the information being provided.

## SECOND LABEL LEARNING

Second label learning may provide insight into both children's confidence in their own knowledge as well as the influence of speaker reliability. Children's willingness to apply a second label to a familiar object is an area of research that has provided much debate. This section will begin with a discussion regarding research examining children's application of Mutual Exclusivity, a proposed word-learning bias which posits that young children are less willing to apply a second label to an object for which they already have a label (Markman, 1990). This bias would simplify word learning by restricting the number of possible referents that may apply to an object. If children are attending to social cues provided by the speaker and relying on word learning biases, such as Mutual Exclusivity (e.g., Au & Glusman, 1990; Jaswal & Hansen, 2006; Liittschwager & Markman, 1994; Markman, 1990; Markman, Wasow, & Hansen, 2003; Markman & Wachtel, 1988; Merriman & Stevenson, 1997), then the question of how children incorporate social information that either reinforces or directly violates the tenets of the bias is raised. I will discuss alternative accounts to Mutual Exclusivity and conclude with

a discussion of how second label learning research may provide insights into children's understanding of speaker reliability.

Children who are learning novel label-novel object associations do not already have a label that could be assigned to the object. These children might be willing to accept a novel name, even from a previously unreliable source, because they have no other options (Koenig & Harris, 2005). Children who are learning a second label for a familiar object already have a name that could be applied to the object, so it is possible that they will be more selective in who they are willing to accept information from. Woodward and Markman (1988) presented 3- to 4-year-old children with a familiar object and a novel object while they heard a novel label. Children honored the Mutual Exclusivity assumption and chose the novel object as the referent of the novel label. Woodward and Markman suggested that children would maintain the Mutual Exclusivity assumption unless there is prominent contextual evidence that it should be overridden. They propose that given a situation in which children are presented with a familiar object and a novel label, the children have three possible choices: They may choose to violate Mutual Exclusivity and accept a second label for the familiar object. They may choose to reject the novel label by not applying it to the familiar object. Finally, they may choose to apply the novel label to a part of the familiar object. Each of these possibilities is dependent on the context in which the novel label is applied to the object.

Mutual Exclusivity is evident in children during the early stages of language development. Markman, Wasow, and Hansen (2003) examined whether children as young as 15 months of age would apply the Mutual Exclusivity assumption during novel label learning, without the use of explicit referential cues. By examining object choices and searching behavior for a referent of the label, Markman et al. determined that 15- to 19-month-old participants avoided applying a second label to an object for which they

already had a name. This provides evidence that the Mutual Exclusivity assumption is present early in word learning and is applied by children when referential cues by the speaker and environment are not evident.

In ambiguous situations, Mutual Exclusivity may help children identify a new category. In a study by Merriman and Stevenson (1997), 24- to 25-month-old children were told a series of stories involving atypical exemplars of objects for which they already had labels, such as a horse with an elongated nose and unusually shaped body, and were tested on whether they would apply either a familiar label or a novel label to such objects. Merriman and Stevenson found that children avoided applying the familiar label to the atypical exemplar when the atypical exemplar had been labeled with a novel label. The assumption that a label has only one referent could facilitate language learning by helping children to link labels with appropriate categories.

Given that Mutual Exclusivity is evident as early as 15 months (Markman et al., 2003), it might be asked when children overcome the Mutual Exclusivity assumption and learn more than one label for an object. It will be necessary during a child's development to attribute multiple labels to objects. Objects are often referred to with more than one label (e.g., a cup is also referred to as a glass, a mug, and a tumbler) and children will be required to learn multiple referents for a single object in order to understand a language. Liittschwager and Markman (1994) note that the Mutual Exclusivity assumption does not deny dual label learning in its entirety, but that it does indicate that it is easier to learn the first label when compared to learning the second label. Children, aged 24 months, participated in one of two conditions: They were either trained with a novel label on an unfamiliar object or with a novel label on a familiar item that children are likely to label incorrectly (e.g., a unicorn, which children are likely to label as a horse). Children in both conditions were then tested on their ability to recognize the trained novel name and their

willingness to apply a different novel label to the target object. Liittschwager and Markman found that 24-month-olds readily learned the trained novel name for the target object in both the familiar and unfamiliar conditions. Two-year-old children were willing to apply multiple labels to an object, overriding Mutual Exclusivity. Liittschwager and Markman attribute this failure to honor Mutual Exclusivity to the strong evidence that the novel label refers to the familiar object through repeated labeling (i.e., each object was labeled 6 times). These results indicate that 24-month-old children can override Mutual Exclusivity when provided with clear cues of the referent if the task is sufficiently simple.

Children are often faced with situations where more than one label is applied to a given object, violating Mutual Exclusivity. Savage and Au (1996) investigated how children between the ages of 3- to 5-years-old would react when they were in a situation in which a novel object was given two novel labels. One label was introduced by a familiar person, the child's preschool teacher, and the other by an unfamiliar person, an experimenter, who had not overheard the label used by the familiar person. The children were tested on production and comprehension of both novel labels. Over a series of 4 studies, the authors found that about half of the children were willing to accept both labels for a single object when offered by two different people, regardless of familiarity. The half that tended to honor Mutual Exclusivity showed an interesting pattern of responding; children tended to favor the first label they were tested on as the proper label for the object, suggesting that they kept both labels in memory and then focused their attention on the first label that the experimenter asked them to apply. It is possible that children consider both familiar and unfamiliar adults as reliable sources of information and wait to see which information will be more relevant for use in future tasks.

Parent conversation cues can also provide evidence for children that an object can have more than one name. Callanan and Sabbagh (2004) studied whether the parents of 12- to 24-month-old children would use multiple labels while interacting with both familiar and unfamiliar objects. Their results suggest that parents are more likely to use multiple labels for the same object when their children have high productive vocabulary abilities. When introducing multiple labels, however, parents were more likely to bridge the labels in such a way as to indicate that there is only one correct or best label that applies to each object (e.g., "Look's like a walrus. Or, no, that's a sea lion."). The authors argue that children with more advanced productive vocabulary scores are given greater access to multiple labels, especially for unfamiliar objects, and that the bridging phrases that parents use may provide a context for them to understand the use of each of the labels. This study suggests that children are attending to the socio-pragmatic evidence/context when labels are being produced in order to discern what is the most appropriate label for an object, especially when more than one label is provided.

Children in a bilingual environment must learn more than one word for an object, and to be successful in doing so, they will need to be able to override Mutual Exclusivity. Research regarding bilingualism and Mutual Exclusivity is limited and, often times, contradictory. Merriman and Kutlesic (1993) found that both monolingual and bilingual children, between the ages of 5 and 8 years, successfully applied Mutual Exclusivity when extending the use of two novel English words. They also found a difference in that bilingual children more readily applied labels from a different language onto objects for which they already had a label. Au and Glusman (1990) found that both monolingual and bilingual 4-year-old children were able to successfully overcome Mutual Exclusivity when presented dual labels for objects in different languages. They suggest that children

are able to make exceptions to Mutual Exclusivity based upon their knowledge that foreign languages have different labels for the same object.

But what about when a speaker provides more than one label for the same object in one language? Davidson and Tell (2005) investigated how bilingual and monolingual children, ages 3- and 4-years-old as well as 5- and 6-years-old, would respond when an object that was familiar to them was given a novel label. They found that bilingual children were less likely than monolingual children to rely on Mutual Exclusivity when applying novel labels to familiar objects. The authors conclude that bilingual children may rely on similar word-learning assumptions as monolingual children, but that they are more flexible in applying them given the ambiguity in their word-learning environment.

Although children can override Mutual Exclusivity when given the cues to do so, both adults and children will adhere to the Mutual Exclusivity assumption when information suggests that it is appropriate. Au and Glusman (1990) tested 3- to 6-year-old children and university students to determine whether Mutual Exclusivity is evident even after childhood. Both age groups were presented with a novel object paired with a novel label. Participants were then asked to match the novel label to the correct novel object, as well as indicate if there was more than one matching object within a set of four objects, two objects each from two different categories. They were also asked to match a different novel word to the same object group. Both adults and children honored the Mutual Exclusivity Assumption by not applying the different novel word to the previously labeled novel object. They also extended both of the novel labels to apply to the separate category pairs, so they generalized their learning of the novel labels. Both adults and children will adhere to Mutual Exclusivity when information in their environment indicates this assumption should be used, as well as disregard Mutual Exclusivity when it is proper to do so.

Mutual Exclusivity is one of a number of proposed principles available that may help to explain how words are learned. Mervis, Golinkoff, and Bertrand (1994) argue for the Novel Name-Nameless Category principle, which states that children will apply novel words to objects for which they do not have a label. The most significant difference between Mutual Exclusivity and N3C is that N3C proponents argue that this principle is not available until after children have reached the vocabulary spurt (Golinkoff, Mervis, & Hirsch-Pasek, 1994). While N3C and Mutual Exclusivity offer similar predictions towards how children will respond during second label learning, N3C would not be a readily available principle in young children's understanding of early word learning. Another difference is that N3C is only applicable when a novel object is available to which children can apply the novel name (Mervis et al., 1994). N3C does not account for situations in which children hear a novel label in the presence of a familiar object, without a novel object available. Mervis et al. argue that in these situations, children will either accept the second label or attend to pragmatic cues as to the speaker's intentions. The review of Mutual Exclusivity has provided evidence that children as young as 15 months of age avoid applying a second label to a familiar object (Markman et al., 2003), which is before the vocabulary spurt is evident. Also, Mutual Exclusivity does not require that a novel object be present in order for children to apply its restriction. Children have three possible outcomes upon hearing a novel label applied to a familiar object: they can accept the second label as another referent for the object, they can reject the label as a referent, or they can apply the novel label to a part of the object being referred to. Children attend to the referential cues of the speaker when determining which outcome is the most appropriate (Woodward & Markman, 1998).

Another early word learning hypothesis is the social pragmatic account, which argues that children use cues from the speaker to hone in on word meanings (Bloom,

2000; Clark, 1988, 1990, 1997). Recent research by Jaswal and Hansen (2006) has argued that Mutual Exclusivity should produce differing predictions than a social pragmatic account of word learning. They proposed that Mutual Exclusivity causes children to disregard information that conflicts with the novel label-novel object association, such as referential intent cues by the speaker, during early word learning. In their study, 3- and 4-year-old children were presented with two objects, one familiar and one novel. The speaker pointed to the familiar object while looking at the child and said, "Can you give me the blicket?" Results indicated that children discounted the pointing gesture and chose the novel object as the referent for the novel label, adhering to the Mutual Exclusivity assumption. One could argue that children disregarded the finger pointing gesture because it was not as strong as other referential cues, such as eye-gaze. In a second study, Jaswal and Hansen (2006) conducted a similar experiment manipulating the speaker's gaze. Three and 4-year-old children were presented a familiar and a novel object, but when the experimenter asked, "Can you give me the blicket?" the question was accompanied with a pronounced change in the gaze of the speaker towards the familiar object. They replicated the results of the previous study in that children chose the novel object as the referent for the novel word, even when the pragmatic cues of the speaker were indicating the familiar object. The authors do not deny that children attend to referential intent cues, but they do propose that Mutual Exclusivity is a stronger constraint and it will be adhered to when there is not overwhelming evidence in the environment that suggests otherwise.

One difference between the Jaswal and Hansen (2006) study and the others reported here is the use of structured versus naturalistic cues. The Jaswal and Hansen study used social cues that were very formal in nature: the pointing cue was a finger placed in the table while the experimenter maintained eye contact with the child. The

experimenter tapped the table twice to draw attention to the finger point. The authors acknowledge that there may be pragmatic cues that will override Mutual Exclusivity, especially when social cues are explicitly referring to an object.

Given that children take into account speaker reliability when learning novel labels for novel objects, would this referential cue provide information about the application of a second label to a familiar object? Birch, Vauthier, and Bloom (2008) used a paradigm that varies from the previous studies to examine 3- and 4-year-old children's willingness to learn a novel label for a novel object. In their study, two puppets representing a previously accurate and a previously inaccurate labeler applied the same novel label to different novel objects (i.e., Ben, the accurate labeler, called a novel object a "ferber" and then Jenny, the inaccurate labeler, called a different novel object a "ferber"). Children were then asked to select which object was the referent to the novel label used by both labelers. Birch et al. found that children were more willing to apply the novel label to the accurate labeler's referent. To extend their findings, Birch et al. investigated children's willingness to apply a second label to an object that had previously been labeled by either an accurate or an inaccurate labeler. In this condition, the puppets each applied the same label to different objects, replicating the beginning of the previous condition. The difference in this condition was the children were asked to select the object that was the referent of a novel label that had not previously been heard (i.e., children saw both Ben and Jenny apply the label "ferber" to different novel objects, but were asked to find the "modi"). Results indicated that children were less likely to apply the entirely novel label to the object that had previously been labeled by the accurate labeler. The authors conclude that children are more willing to apply to the Mutual Exclusivity assumption when social cues reinforce their expectations that a speaker is reliable.

Second Label Learning also provides the opportunity to examine many of the concepts that will be discussed throughout this paper, such as how social pragmatic cues influence children's willingness to learn novel information. Many of the cues that speakers provide when interacting with children can be examined with regard to children's willingness to apply a novel label to an object for which they already have a label. Children's confidence in their own knowledge of a label, their familiarity with the objects being labeled, and their understanding of others' intentions may all play a part in their willingness to learn from others (Clark, 1983, 1987; Golinkoff, Mervis, & Hirsch-Pasek, 1994; Jaswal & Hansen, 2006; Markman, 1990; Markman & Wachtel, 1988; Mervis & Bertrand, 1994; Mervis, Golinkoff, & Bertrand, 1994). Also, children's own knowledge and experience is a factor in second label learning. By examining situations in which children have their own knowledge challenged by novel information, a more distinct sense of children's interpretation of reliability may be determined.

## SUMMARY

This review focused on three questions that would help guide the discussion on referential intent cues in the greater context of early word learning and later theory of mind. With regard to the first question, speaker reliability was discussed in terms of being one of many social-pragmatic cues that children attend to in order to aid in the understanding of others' intentions and goals. Children make judgments about a speaker's referential intent using both nonverbal behavioral cues, such as eye-gaze, and verbal cues, such as the accuracy of the information the speaker provides about an object. By attending to referential cues, children are able to hone in on meaning by narrowing the number of possible interpretations for a novel word and assessing the likelihood that a label is accurate.

It would be overwhelming to have to keep track of every instance of accurate and inaccurate behavior that a speaker may provide, so it is possible that children are simplifying the information by judging the overall reliability of a speaker. One example would be the child's mother, who often provides generally acceptable labels for novel objects (i.e., that four legged, hairy, medium size animal is a "dog" and is called that same label by more than one person). A child's mother may not always have the accepted label for every object, as in the case of those pesky dinosaur names, but overall she is a reliable source of linguistic information. This ability to attend to overall accuracy develops with age and experience: as children learn more about a speaker's mental state, they are then able to make more accurate judgments about reliability.

The second question relates to children's understanding of speaker reliability. As children grow older, they gain a better understanding of the cues that describe a person's knowledge. Three-year-old children may be more susceptible to inaccuracy, and in turn deception, because they do not have a sophisticated understanding of others' mental states. As children's theory of mind becomes more adult-like, they are better able to make judgments about other people's mental states. Children also take into account the reliability information provided by the speakers, such as their familiarity, experience, ignorance, and knowledge, when determining whether to learn novel information.

Finally, I discussed how children's understanding of speaker reliability may be better understood by examining their willingness to learn second labels for familiar objects. During second label learning, one must take into account both the child's knowledge and the speaker's knowledge when interacting in a language task. As children gain a more sophisticated level of understanding others' mental states, they are able to make decisions about whether their knowledge is more reliable than another person's information.

Children's ability to attend to social-pragmatic cues is part of a more encompassing understanding of other people as sources of information. Children may apply assumptions, both about other people and more specifically about objects, to simplify the amount of information they must attend to in their environment. Children's understanding of other people as intentional beings with their own knowledge helps in early word learning. It guides children's willingness to learn from others as well as influences their confidence in their own knowledge. Children benefit from the combination of understanding that individuals have their own mental states, and that referential intent cues provide information about those mental states. The purpose of the present research is to examine children's understanding of referential cues that offer information regarding a speaker's knowledge about objects. A better perspective on children's interpretation of mental state cues is gained by examining their willingness to learn either first or second labels for objects. This study investigated whether children take into account a speaker's intentions, as indicated by the speaker's verbal and nonverbal behavior, in deciding whether to adhere to or override Mutual Exclusivity.

Koenig, Clément, and Harris (2004) found that 3-year-old children were less likely to use speaker reliability than 4-year-old children, but that this difference was due to the younger children's difficulties in identifying and retaining information about speaker accuracy. To address this issue, Krogh-Jespersen and Echols (2009) made reliability cues offered by the speaker highly salient and, to simplify the memory demands, a single labeler provided either accurate or inaccurate labels (in contrast with the procedure used by Harris, Koenig, and colleagues, which uses two labelers). Because little is known about the degree to which children younger than 3 years make use of previous reliability, this study focused on 24-month-old children. Children were tested to determine whether they would learn either a novel label for an object that was unfamiliar

to them or a second label for an object for which they already had a label. Children were willing to learn a novel label for a novel object from both an accurate and an inaccurate labeler. However, children were less willing to learn a second label for a familiar object from an inaccurate labeler than an accurate labeler. It may be that a second label task is more sensitive because children can rely on their own knowledge if they have reason to doubt the information provided by an unreliable labeler. By simplifying the amount of information that children had to attend to, young children's willingness to learn novel label information from accurate and inaccurate speakers can be examined.

Perhaps both prior knowledge and referential intent play a role in children's willingness to accept a novel label from either a reliable or an unreliable labeler for an unfamiliar versus a familiar object. Prior research suggests that, by the age of 4 years, children are reluctant to learn a novel label for a novel object from either an ignorant labeler or an inaccurate labeler. However, 3-year-old children are skeptical only of ignorant speakers (Koenig & Harris, 2005). Birch et al. (2008) found that 3- to 4-year-old children would adhere to the restrictions of Mutual Exclusivity, meaning they would restrict the number of labels that could apply to an object that had been previously been given a label by an accurate speaker, when speaker reliability cues indicated that the speaker was an accurate source of information. Children in the Krogh-Jespersen and Echols study were more willing to apply a novel label to a familiar object, thereby overriding Mutual Exclusivity, when they had interacted with a previously accurate adult speaker than a previously inaccurate adult speaker.

My dissertation research further investigates how 24-month-old children respond to cues regarding a speaker's reliability by contrasting their responses to a speaker who is knowledgeable about objects against one who is ignorant or uncertain when providing labels for familiar objects. Little is known about children's understanding of speaker

reliability cues during novel label learning at such a young age. Children's understanding of referential cues and mental state knowledge is an area of research that provides insight into how children are interpreting the social information in their environment when learning novel information from an unknown speaker.

In Study 1, two-year-old children were exposed to a speaker who established either his/her knowledge or ignorance about a series of familiar objects. The speaker does not provide explicit labeling information to indicate his or her accuracy, instead providing information about his or her mental state knowledge. Children are able to judge the reliability of the speaker based on verbal phrases indicating the speaker's familiarity with the objects and referential cues, such as tone of voice and facial expression. Children then heard novel labels either for familiar or novel objects, and their willingness to apply those labels was tested. In Study 2, a more nuanced understanding of speaker credibility was investigated by having two-year-old children interact with an uncertain speaker. The uncertain speaker presented a lack of confidence in the knowledge s/he had with statements like: "I think that's a ____." Children in the uncertain condition heard the objects labeled either accurately or inaccurately. Children's willingness to apply a second label to a familiar object was examined.

When speaker reliability cues support the expectation that an adult is knowledgeable about objects, children may accept novel label information about both novel and familiar objects, learning a second label for the familiar object. However, when speaker reliability cues do not support that a speaker is a credible source of information, as in the case of an ignorant or an uncertain labeler, children may choose to reject the information provided by the speaker and rely instead on their own knowledge.

# Chapter 3: Study 1

## METHOD

### Participants

Sixty-four children (32 males and 32 females) within the ages of 24-25 months ($M$ = 24.47 months, range = 23.70 to 25.90 months) participated in this study. The sample primarily was Caucasian and middle class (White-72%, Hispanic/ Latino-15%, Asian American- 8%, African American–3%, Other-2%). According to parental report, none of the participants heard a language other than English for more than 20% of their total language exposure. Participants were recruited from a database maintained at a university research lab. Each child participated individually in one thirty-minute experimental session and was given a small token of appreciation (e.g., a t-shirt) for participation.

### Materials and Design

This study has a between-subjects design in which each condition had a total of 16 participants, with equal numbers of males and females within each condition. Children interacted with either a Knowledgeable or Ignorant speaker, who, after establishing reliability, provided novel labels for either familiar or novel objects. One quarter of the children in this study interacted with a Knowledgeable speaker during the reliability period and then heard that speaker provide novel labels for novel objects (First Label Knowledgeable condition); one quarter interacted with an Ignorant speaker who later provided novel labels for novel objects (First Label Ignorant condition); one quarter interacted with a Knowledgeable speaker who later provided novel labels for familiar objects (Second Label Knowledgeable condition); and one quarter interacted with an

Ignorant speaker who later provided novel labels for familiar objects (Second Label Ignorant condition). Prior to the study, parents completed a vocabulary checklist to determine their child's familiarity with the objects and labels that were to be used during the experimental session (see Appendix A). The checklist consists of a list of toys and household items selected from the MacArthur-Bates Communicative Development Inventories (CDI; Fensen, Dale, Reznick, Thal, Bates, Hartung, Pethick, & Reilly, 1993) and from suggestions from participants in prior studies. Six objects reported by parents to be known to their child were selected for use in the reliability period of the study. Four additional objects, 2 targets and 2 distracters, were used during Novel Label and test trials. Objects presented the during the Novel Label trials were consistent across subjects, whereas objects presented during the reliability period varied depending on the vocabulary of the participant.

For First Label conditions, the target objects used for the test trials consisted of one of two sets of novel objects for which a 24-month-old child is unlikely to know a label. The two sets of novel objects were: (1) half of a purple spiky ball and an abstract bird stamp and (2) a spinning top and a wooden bell-shaped toy. One set of novel objects was used as the target objects and the other set served as the novel distracters. For Second Label conditions, the two target objects used for the test trials were highly familiar items: a stuffed toy dog and a blue ball. One of the two sets of novel objects described above was used as distracters in the test trials. The use of each set, as well as order of presentation, was counterbalanced in each condition.

**Procedure**

Before the experiment began, children were given a familiarization period with the objects that were to be used in the testing phase of the experiment in order to decrease the likelihood that object or novelty preferences would affect performance during test

trials. In the First Label conditions, children were allowed to play with the four novel objects. For the Second Label conditions, they were given an opportunity to play with a dog, a ball and the two novel objects that would serve as distracters. The familiarization period lasted until the child had played with each object. If the child did not attend to a particular object, the experimenter selected each object once and said, "Look at that one," so that each object had been attended to during the familiarization period. No labels were used during this time. Following familiarization, the objects were placed in a red covered box. The box was placed on the floor and hid all of the objects from view during the labeling procedure.

The familiarization period was followed by a reliability period in which the experimenter established the credibility of his/her labeling behavior and, specifically, his/her level of knowledge of object names. During this period, children either sat on their parent's lap or stood in front of their parent, across from a seated experimenter. The experimenter chose a familiar object (one indicated by the parent as known to the child) out of the red box, held it out and looked at the child to initiate eye contact, then looked at the object and kept focus on the object being referred to throughout the remainder of the trial. The experimenter referred to the object in a way that indicated the level of the experimenter's familiarity. In both conditions, after the first phrase referencing the object had been produced, the experimenter then placed the object within the child's hands to increase the child's interest in the object being referenced. If the child did not indicate any interest in holding the object being referenced, the experimenter placed the object on the table halfway between the child and the experimenter. After referring to the object 5 times, the experimenter replaced the object in the red box, chose a second object, and repeated the process with the new object for a total of 6 such reliability trials.

During the reliability period, children interacted with either a Knowledgeable or an Ignorant speaker. The experimenter communicated his or her degree of familiarity with the object through the wording and expressive cues presented during the trials. Children in the Knowledgeable condition interacted with an experimenter who referred to the familiar object being presented with the phrase: "I know what that is. What's that? I know what that is. What's that? I know what that is." Each object was referred to 5 times in this manner in order to maintain consistency with the Novel Label trials, as will be described (see Appendix B for scripts for each condition). The Knowledgeable speaker appeared confident when referring to the object. For children in the Ignorant condition, the experimenter displayed a clear lack of knowledge about both the familiar object and its name through the following phrasing: "I don't know what that is. What's that? I don't know what that is. What's that? I don't know what that is." The Ignorant speaker maintained a demeanor of confusion and unfamiliarity with the object being presented. Consequently, children could base their judgments of the credibility of the speaker both using the phrases provided and the social-pragmatic information available. The knowledgeable speaker was confident and neutral when referring to objects whereas the ignorant speaker reflected a lack of knowledge in tone of voice, body posture and facial expression. These cues were salient indicators of the speaker's trust in his or her own knowledge.

After the reliability period in which the experimenter either appeared Knowledgeable or Ignorant about the referent objects, children were presented with two Novel Label trials. Children in the First Label conditions heard a novel label applied to a novel object whereas children in Second Label conditions heard a novel label applied to a familiar object. The Novel Label trials were identical to the previous trials in object presentation. Each object was taken from the red box and labeled 5 times while the child

was attending to it. For the Second Label Conditions, the two Novel Label trials made use of a toy dog and a ball. For the First Label Conditions, the two Novel Label trials each made use of a novel toy; because these toys are unfamiliar, children should not already have a label for them. Across conditions, the experimenter confidently labeled these objects using the following phrases, one per Novel Label trial, "That's a danu" and "That's a gep." Children heard each object labeled 5 times with one of the nonsense words per trial. The object presented in each trial was thus referred to a total of 5 times. The order of the presentation of the label, as well as the assignment of the label to the object, was counterbalanced within conditions.

Following the two Novel Label trials, the experimenter conducted two test trials during which four objects were placed on the table in front of the child: an object from a Novel Label trial, two randomly chosen objects from the six presented during the reliability period, and one unfamiliar object that had not previously been labeled. The experimenter asked the child to indicate the referent for each of the novel labels that had been previously presented by saying: "Where's a (nonsense word)? Can you point to the (nonsense word)?" If the child did not respond, the experimenter prompted again: "Can you point to a (nonsense word)?" The child was praised regardless of which objects he or she chose. The positioning of the objects varied across trials and was counterbalanced across children within a condition such that a particular object appeared equally often on the left, the right, the inside, and the outside of the 4 objects presented at test. The study session was videotaped using a camcorder. See Figure 1 for a schematic of the procedure.

**SCORING**

For each trial, a correct choice, meaning the child chose the object that was labeled with the novel word, was given a score of one. If the child chose incorrectly, meaning the child chose either one of the two familiar objects or the novel object that had

not been given a label, the child was given a score of zero. A refusal to choose any object was coded as a zero as well. Responses were combined across the two test trials to yield a coding score of either zero correct, one correct, or two correct.

**RESULTS**

A chi-square analysis revealed a significant difference in the frequencies of children who responded by choosing the target object on zero, one, and two test trials depending on condition, [$\chi^2$ (3, N=64) = 16.6, $p$ = .01]. Table 1 shows the frequencies of children in each condition who responded by choosing an exemplar on zero, one, and two test trials for each of the following answer types: target object choices, familiar distracter choices, novel distracter choices, and refusals to choose.

Follow up t-tests revealed that participants did not differ in their target object choices between the First Label Knowledgeable condition ($M$ = 1.19, $SD$ = .66) and the Second Label Knowledgeable condition ($M$ = 1.06, $SD$ = .57), t (30) = -.57, $p$ =. 57 (this and all t-tests to follow are two-tailed). However, participants in the First Label Ignorant condition ($M$ = 1.19, $SD$ = .91) were more likely to chose the target object as the referent than participants in the Second Label Ignorant condition ($M$ = 0.63, $SD$ = .50), t (30) = -2.17, $p$ = .04. Participants in the Second Label Knowledgeable condition were also more likely to select the target as the referent than were participants in the Second Label Ignorant condition, t (30)= -2.3, $p$ = 03. Finally, it is interesting to note that participants in the First Label Knowledgeable condition did not differ from participants in the First Label Ignorant condition, t (30) = .00, $p$ = 1.00 (see Figure 2 for a graph of means with standard errors across conditions). These results suggest that children were more likely to learn a second label for a familiar object from a knowledgeable speaker than an ignorant one. In contrast, when the object was novel, children were willing to learn regardless of previous reliability.

Tests against chance also were conducted as a measure of learning of novel labels. A chance level of .25 (1 in 4 objects) per trial was used to determine children's likelihood of selecting the target object. Using a one-sample t-test, children's target object choices in the First Label Knowledgeable condition, $t(15) = -4.20$, $p = .00$, the Second Label Knowledgeable condition, $t(15) = 3.90$, $p = .00$, and the First Label Ignorant condition, $t(15) = 3.02$, $p = .01$, were above chance levels. Children in the Second Label Ignorant condition did not differ significantly from chance, $t(15) = 1.00$, $p = .33$.

A chi–square analysis examining whether children selected the target object choice correctly on the 1st or the 2nd test trial (i.e., the number of children per condition who selected the target object correctly on the 1st trial compared with the number of children per condition who selected the target object correctly on the second trial) revealed no significant differences, [$\chi^2$ (3, N=64) = 1.36, $p = .71$]. These results suggest that children did not have difficulty retaining information about the target referent across trials and that the task did not tax their memory capabilities.

When participants selected the wrong object, they made revealing errors. Recall that in the test trials, children were presented with the target object, two previously labeled familiar distracters and a novel distracter that had not been given a label. A chi-square analysis was conducted in which children were grouped based on their scores (i.e., the number of children choosing 0, 1, or 2 familiar distracters across the 2 test trials). This analysis revealed that participants in the Second Label Ignorant condition were more likely to choose a familiar distracter as the referent for the novel label than were participants in the First Label Ignorant condition [$\chi^2$ (2, N=32) = 8.57, $p = .01$]. Participants in the Second Label Knowledgeable condition were also more likely to choose a familiar distracter as the referent for the novel label than were participants in the First Label Knowledgeable condition [$\chi^2$ (2, N=32) = 6.07, $p = .048$]. There were no

differences in familiar distracter choices between the First Label Ignorant and First Label Knowledgeable conditions [$\chi^2$ (2, N=32) = 2.13, $p$ = .34], and no differences between the Second Label Ignorant and Second Label Knowledgeable conditions [$\chi^2$ (2, N=32) = 3.26, $p$ = .20].

A similar chi-square analysis on novel object choices found that participants in the Second Label Knowledgeable condition were more likely to select a novel distracter as the referent for the novel label than were participants in the Second Label Ignorant condition, [$\chi^2$ (2, N=32) = 5.96, $p$ = .05]. No other comparisons reached significance with regard to novel distracter choices. No comparisons between conditions on the frequency of refusal to choose responses were significant.

**DISCUSSION**

Results from Study 1 indicate that by the age of 24 months, children are actively forming judgments about the credibility of unknown speakers and using these judgments to determine their willingness to learn novel labels from that source. During First Label conditions, children were willing to accept a novel label for a novel object regardless of the level of knowledge the speaker presented. During Second Label conditions, children were more willing to learn the novel label for a familiar object when the speaker expressed knowledge about other common objects than when the speaker expressed ignorance. These results support similar findings regarding second label learning with older children (3- to 4-year-olds) by Birch et al. (2008), and offer insight into understandings of ignorance at an age for which this ability has not previously been studied. Children actively evaluate the sources of information available to them and consider the credibility of the source when evaluating the accuracy of the novel information.

The results from the present study replicate findings by Krogh-Jespersen and Echols (2009) regarding children's novel label learning from either an accurate or inaccurate speaker for either novel or familiar objects. In the Krogh-Jespersen and Echols study, 24-month-old children interacted with a speaker who was either accurate (e.g., presented a car and said, "That's a car") or inaccurate (e.g., presented a car and said, "That's a duck") during the Reliability Period. The Novel Label trials and test trials were identical in procedure to Study 1. Children were willing to learn a novel label for a novel object, regardless of the previous accuracy of the speaker. However, when the speaker was inaccurate, children were less willing to learn a novel label for a familiar object than when the speaker had been accurate. Children may be more willing to learn novel label information about novel objects when interacting with a single experimenter than when given a choice between two experimenters, regardless of familiarity with the object. When given a choice between two experimenters, children have the option of disregarding information provided by one of the sources. When interacting with a single experimenter, children have only their own limited knowledge about the novel object and the information provided by the experimenter to determine the label for the novel object. However, when children have information to rely upon, as in the case of Second Label conditions, they are more willing to learn from a reliable source than from an unreliable one. During second label learning, children have the option of relying on their previous knowledge about the label for the familiar object, and this may lead them to be more discriminating in their willingness to accept a novel label.

There is a difference between the finding that children will learn a novel label for a novel object from both a knowledgeable and an ignorant speaker and the finding from Koenig and Harris' (2005) study that children as young as 3 years attend to ignorance as a salient indictor of unreliability. As mentioned in the review, a possible confound in the

Koenig and Harris' study is that children were given a decision as to whether to rely on a speaker who had provided accurate information (e.g., a speaker looked at a cup and said, "That's a cup.") and a speaker who was ignorant about the names of objects (e.g., a speaker looked at a cup and said, "I don't know what that is.") In this paradigm, children may choose to rely on the speaker who has provided a label as opposed to the ignorant speaker, who has not. In the study presented here, neither speaker provided labels for objects. Both speakers used phrasing that was closely matched in length and in word choice. Children could make their judgments about the speaker's reliability based upon the phrases and the social cues provided, but were given no explicit information about the speaker's accuracy with regard to labels for objects. During interactions with others, children may have to rely on more than just accuracy information to determine the credibility of a source of information. Upon encountering an unfamiliar adult, children may rely on social-pragmatic cues as to whether the adult is knowledgeable if the adult has not provided explicit labeling information. Children are taking into account referential cues from speakers that extend beyond the accuracy of the information being provided.

Children's incorrect answer choices when asked to indicate the referent for the novel label also presented interesting insight into their possible interpretations of the task. Children who answered incorrectly in the Second Label Ignorant and Second Label Knowledgeable conditions were more willing to indicate that a familiar distracter was the referent than were children in either the First Label Ignorant or First Label Knowledgeable conditions. Rather than learning that the novel label applied to the target object, it may be that these children assumed that the experimenter in the Second Label conditions was applying a nonsense word to any familiar object and, therefore, applied this rule to the test trials. Given that children did not show a similar pattern with regard to

incorrect novel distracter choices, it may be that children are attempting to create a strategy for interacting with the speaker that involves learning the rules for the game, such as the speaker calls familiar objects by funny names. It is not possible to determine children's interpretations of the speaker's behavior within the scope of this study, but it is clear that children are making judgments about the validity of the information provided by the speaker.

Although it is not possible to determine children's understanding of the ignorant labeler, there are at least two distinct interpretations that they could be entertaining. Children who interact with a speaker who portrays a lack of knowledge about familiar objects may infer that the speaker is familiar with the objects being presented but is unaware of the labels that apply to them. Another interpretation, which may account for children's willingness to learn in the First Label conditions, is that the speaker is ignorant about objects typically familiar to the child, but is knowledgeable about novel objects that are unfamiliar to the child. It is unknown what characteristics or interpretations children are applying to the ignorant speaker, beyond the result that they are less willing to learn from him or her when they have preexisting knowledge about the objects.

In Study 1, children were able to make judgments about a speaker's knowledge based upon facial expression, tone of voice, and labeling phrases without the use of accurate or inaccurate labels. The purpose of Study 2 is to examine their ability to incorporate facial expression and tone of voice cues with explicit information about a speaker's knowledge or lack thereof. To return to the example of an adult faced with various dinosaur genera, one possible outcome of being asked to provide the label for a dinosaur with a long neck and tail is to simply guess a possible name in such a way as to indicate the adult's uncertainty in the label information being provided, such as: "I think that's a brontosaurus." The expression of confusion on the adult's face, coupled with an

unsure voice, and explicit uncertainty in the phrase may indicate to the child that the information being provided is likely to be inaccurate. In the following study, children interacted with a speaker who provided either accurate or inaccurate information about familiar objects in a manner that expressed uncertainty about the information being offered. Following this uncertainty, the speaker presented two familiar objects and confidently labeled them with nonsense words, possibly contrasting the previous uncertainty that the speaker presented. Children's willingness to apply the novel labels to the familiar objects was investigated. It is unknown how children as young as 24 months will respond to a speaker who provides accurate information, but does not express confidence in the information being provided. The labeling information being provided indicates the speaker is reliable; however, the social-pragmatic information reveals a lack of certainty that could influence children's judgments of speaker knowledge. Also of interest is whether children will regard an inaccurate labeler, who is uncertain about the information being provided, as an unreliable source of information given that the speaker is incorrect but may be aware that the information is unreliable. Children may interpret the uncertainty with inaccurate information as the adult's way of indicating that the information he or she is provided is not correct; therefore, children are given the opportunity to mark this information as not being the most reliable for future use. . If children are attending to the accuracy of the speaker, they should be less willing to learn novel labels for familiar objects from an uncertain inaccurate speaker than from an uncertain accurate speaker. However, if children are attending to the confidence of the speaker as the most salient indication of reliability, it is possible that children will be unwilling to learn from either speaker, as both speakers present cues to their doubt in the information being provided. Finally, children may attend to the change in confidence that the speaker presents (e.g., the speaker who was previously doubtful about labeling

information is confident about the novel labels for familiar objects), which may increase their willingness to learn from either speaker.

# Chapter 4: Study 2

## METHOD

### Participants

Thirty-two children (16 males and 16 females) within the ages of 24-25 months ($M$ = 24.28 months, range =23.90 to 24.93 months) participated in this study. The sample primarily was Caucasian and middle class (White-75%, Hispanic/Latino-16%, Asian American- 6%, Other-3%). According to parental report, none of the participants heard a language other than English more than 20% of their total language exposure. Participants were recruited from a database maintained at a university research lab. Each child participated individually in one thirty-minute experimental session and was given a small token of appreciation (e.g., a t-shirt) for participation.

### Materials and Design

The design and procedure for this study was identical to the Second Label conditions described in Study 1 with the exception of the speaker's labeling behavior during the reliability period. In this study, children interacted with an experimenter who presented a lack of confidence in the knowledge he or she had about familiar objects through facial expression, tone of voice, and with the following statements: "I think that's a ____. What's that? I think that's a _____. What's that? I think that's a _____." The experimenter provided either Accurate labels (e.g., presents a car and says, "I think that's a car.") or Inaccurate labels (e.g., presents a car and says, "I think that's a banana.") for the familiar objects being presented. During the Inaccurate Uncertain condition, the experimenter labeled the object with the name of a different familiar object also being used in the experiment (see Appendix B for scripts for each condition). Half of the

participants in the study participated in the Uncertain Accurate condition and half participated in the Uncertain Inaccurate condition, with equal numbers of males and females within each condition. Each object was referred to using 5 phrases, as in Study 1. The 2 Novel Label trials and 2 test trials were identical in presentation to the Second Label conditions in Study 1. Children's willingness to accept novel labels (e.g., "gep" and "danu") for familiar objects (e.g., the toy dog and ball) was examined. See Figure 3 for a schematic of the procedure.

**Scoring**

For each trial, a correct choice, meaning the child chose the object that was labeled with the novel word, was given a score of one. If the child chose incorrectly, meaning the child chose either one of the two familiar objects or the novel object that had not been given a label, the child was given a score of zero. A "No Response" was coded as a zero as well. Responses were combined across the two test trials to yield a coding score of either zero correct, one correct, or two correct.

**RESULTS**

A chi-square analysis by condition revealed no significant differences in the frequency of children's target object choices on zero, one, and two test trials, [$\chi^2$ (2, N=32) = 1.60, $p$ = .45]. Table 2 shows the frequencies of children in each condition who responded by choosing an exemplar on zero, one, and two test trials for each of the following answer types: target object choices, familiar object choices, novel object choices, and refusals to choose. Follow-up t-tests revealed that participants did not differ in their target object choices between the Uncertain Accurate condition ($M$= 1.06, $SD$=. 68) and the Uncertain Inaccurate condition ($M$=. 88, $SD$= .81), t(30) = .71, $p$ = .48.

Tests against chance also were conducted as a measure of learning of novel labels. A chance level of .25 (1 in 4 objects) per trial was used to determine children's likelihood of selecting the target object. Using a one-sample t-test, children's target object choices in the Uncertain Accurate condition, $t(15) = 3.31$, $p = .01$, were greater than chance. Children in the Uncertain Inaccurate condition did not differ significantly from chance, $t(15) = 1.86$, $p = .08$.

A chi–square analysis examining whether children selected the target object choice correctly on the 1st or the 2nd test trial (i.e., the number of children per condition that selected the target object correctly on the 1st trial compared with the number of children per condition that selected the target object correctly on the second trial) revealed no significant differences, [$\chi^2$ (1, N=32) = .04, $p = .84$]. These results suggest that children did not have difficulty retaining information about the target referent across trials and that the task did not tax their memory capabilities.

Recall that in the test trials, children were presented with the target object, two previously labeled familiar distracters and a novel distracter that had not been given a label. A chi-square analysis was conducted in which children were grouped based on their scores (i.e., the number of children choosing 0, 1, or 2 familiar distracters across the 2 test trials). There were no differences in familiar distracter choices between Uncertain Accurate and Uncertain Inaccurate conditions [$\chi^2$ (2, N=32) = 2.95, $p = .23$], as well as no differences between novel distracter choices [$\chi^2$ (2, N=32) = 1.65, $p = .44$] and no differences in refusal to choose answer types, [$\chi^2$ (2, N=32) = 2.29, $p = .32$].

## DISCUSSION

This study provides insight into children's understanding of both verbal and nonverbal social cues to a speaker's reliability. Children who interacted with a speaker who provided accurate labels in an uncertain manner were willing to learn the novel

labels for the familiar objects at above chance levels, whereas children performed at chance levels on the label learning trials after interacting with an uncertain inaccurate speaker. However, there were no significant differences between the Uncertain Accurate and Uncertain Inaccurate conditions in target object choice or types of errors. The speaker's expression of doubt in the information being provided influenced children's willingness to learn novel labels for familiar objects. This finding is different from the previous finding that 2-year-olds are less willing to learn second labels for familiar objects from inaccurate speakers than from accurate speakers (Krogh-Jespersen & Echols, 2009). However, differences in speaker reliability cues may account for the variation. Children in the Krogh-Jespersen and Echols (2009) study were presented with a reliability period similar to this study with the token difference being that the speaker labeled the familiar objects either accurately or inaccurately in a neutral tone and offered no other referential cues to the speaker's knowledge. Therefore, children should have based their judgments of the speaker's credibility on the accuracy of the information being provided. Children, in the present study, may not have based their judgments of the speaker's reliability solely on whether the speaker provided accurate information, but, rather, they may have taken into account the speaker's verbal phrasing, as well as gaze, tone of voice, body posture, and facial expression cues, when deciding whether to accept or reject the novel information being provided. These social cues may have overridden the accuracy information being presented.

Also, recall that the speaker had a marked change in demeanor from uncertain during the reliability period to confident during the Novel Label trials. Children in the Uncertain Accurate condition may have been willing to accept a novel label for a familiar object given that the speaker, who had previously been unsure when providing the appropriate labels for familiar objects, was now certain in his or her knowledge of the

label that applied to the object. Children in the Uncertain Inaccurate condition may have already formed a judgment about the speaker as being unreliable, but, when faced with a shift in confidence, their willingness to learn may have increased slightly. The design of the present study does not allow this possibility to be examined, but it does support previous research findings (Jaswal & Malone, 2007; Sabbagh & Baldwin, 2001) that children are attending to how confident a speaker appears when providing novel label information.

# Chapter 5: Comparisons across Study 1 and Study 2

## RESULTS

Further analyses were conducted to examine children's willingness to learn across varying levels of reliability with regard to Second Label learning. A chi square analysis examining the frequency of children's target object choices on zero, one, and two test trials across the 4 Second Label conditions (i.e., Knowledgeable, Ignorant, Uncertain Accurate, and Uncertain Inaccurate) revealed no significant difference, [$\chi^2$ (6, N=64) = 8.46, $p$ = .21]. Table 3 shows the frequencies of children in each condition who responded by choosing an exemplar on zero, one, and two test trials for each of the following answer types: target object choices, familiar object choices, novel object choices, and refusals to choose.

Planned comparisons were conducted to examine children's target object choices and patterns of error between conditions. An independent samples t-test revealed that children in the Uncertain Accurate condition were more likely to choose the target object than children in the Second Label Ignorant condition, t (30) = 2.07, $p$ = .047. Children in the Second Label Knowledgeable condition were equally willing to apply the novel label to the target object as children in the Uncertain Accurate condition, t (30) = .00, $p$ = 1.00. There were also no significant differences in target object choice between Second Label Ignorant and Uncertain Inaccurate, t (30) = -1.05, $p$ = .30, and between Second Label Knowledgeable and Uncertain Inaccurate, t (30) = -.76, $p$ = .45 (see Figure 4 for a graph of means with standard errors across conditions).

Children did not show a significant difference in novel distracter choice across conditions, [$\chi^2$ (6, N=64) = 11.69, $p$ = .07]. However, there were significant differences in familiar distracter choice, [$\chi^2$ (6, N=64) = 13.18, $p$ = .04], and refusals to choose, [$\chi^2$

(6, N=64) = 12.76, $p$ = .047]. With regard to familiar distracter choice patterns, 44% of children in the Second Label Knowledgeable condition, 75% of children in the Second Label Ignorant condition, 13% of children in the Uncertain Accurate condition, and 38% of children in the Uncertain Inaccurate children chose the familiar distracter on 1 or more test trials. With regard to children's refusal to choose an object during the test trials, 6% of children in the Second Label Knowledgeable condition, 19% of children in the Second Label Ignorant condition, 56% of children in the Uncertain Accurate condition, and 31% of children in the Uncertain Inaccurate condition refused to select an object on at least 1 of the 2 test trials. See Table 3 for the frequency of children's object choices by type of exemplar and condition across zero, one, and two test trials.

# Chapter 6: General Discussion

Referential intent cues may play an important role in early word learning by offering children additional information about the language environment. The results from Study 1 and Study 2 suggest that by 24 months, referential cues, such as the speaker's prior reliability, may influence children's willingness to apply a second label to a familiar object (i.e., override Mutual Exclusivity). Results from the First Label conditions show that children will learn a novel label for an unfamiliar object, regardless of the labeler's level of knowledge. Results from the Second Label conditions suggest that children may have a sophisticated understanding of reliability that takes into account both verbal phrases and referential cues as indicators of the speaker's level of knowledge or confidence.

Children in the Uncertain Accurate condition interacted with a speaker who provided referential cues that, while not violating assumptions of reliability, also did not reinforce the expectation that adults are confident providers of accurate information. Children in this condition were equally likely to learn a second label for a familiar object as children who interacted with a confident speaker, who did not provide labels, in the Second Label Knowledgeable condition. This supports the expectation that children are willing to learn novel labels for familiar objects from speakers who provide some cues that indicate the information is reliable. Children in the Second Label Ignorant and Uncertain Inaccurate conditions learned novel labels at chance levels, meaning they were not successful at applying the novel labels to the familiar objects. When children encounter a speaker who does not indicate that he or she is a reliable source of information, children may be less willing to learn novel labels for familiar objects.

It is interesting to note that children appear not to take into account the reliability of the speaker when learning novel labels for novel objects (i.e., the First Label conditions). One possibility is that prior knowledge and referential intent influence children's willingness to accept a novel label. The children in the First Label conditions did not already have a label that could be assigned to the object. These children might have accepted a novel name, even from a previously unreliable source, because they had no other options. Because children in the Second Label conditions had a name that could be used for the object, they could be more selective in who they accepted information from. If the novel label was provided by a previously reliable source, they may have been more likely to believe that the novel word was an alternate name for the object, particularly given that the labeler's gaze and other social cues explicitly and consistently indicated that she or he was referring to the object in all conditions.

Another possible interpretation of the results is that children may have difficulty retaining information that does not match their existing knowledge when a speaker is not providing reliable information. Because of the cognitive burden imposed by the unreliable labeler, children then have difficulty learning the novel label for the target object. This interpretation does not seem likely given that children had no difficulty learning the novel label for the novel object in the First Label conditions. In both the First Label and the Second Label conditions, children interacted with an experimenter who presented familiar objects and referred to them during the first 6 trials. The only difference between conditions was the familiarity of the objects that were associated with novel labels in the final 2 trials. Children in the First Label Ignorant condition did not differ in target object choice from the First Label Knowledgeable condition, meaning that even with the cognitive load imposed by an ignorant labeler, children were able to learn the novel label for a novel object. Also, results indicate no differences in target object

selection between test trial 1 and 2 in both studies, which might be expected if memory and processing demands were constraining performance.

Aspects of the methodology, as previously addressed in the Discussion section of Study 1, also may have influenced the finding that 24-month-old children were willing to learn a novel label for a novel object regardless of the source of information in the First Label conditions. Previous studies (e.g., Koenig & Harris, 2005) have found that 4-year-old children, and under some circumstances 3-year-old children, are more willing to learn a novel label for a novel object from a previously accurate speaker than from a previously inaccurate speaker. The Koenig and Harris procedure gives children another option in a first label learning context aside from accepting the inaccurate speaker's label: they can accept a label from a previously accurate speaker. In contrast, in the current procedure children had no available label other than that provided by the ignorant speaker. In second label learning, children do have another option-their own label. Consequently, the differing results are compatible with the position that speaker reliability is most likely to have an effect when children have other information sources that they can use. Though not eliciting evidence of previous reliability on first label learning, the single labeler procedure may be more successful in eliciting speaker reliability effects in young children, at least in a second label learning context, because there is less information to track; younger children appeared to have difficulty retaining speaker reliability information in the two-speaker procedure (Koenig et al., 2004).

Insight into children's understanding of the task may be found when examining their error patterns. Across the Second Label conditions, children's pattern of errors varied depending on the behavior of the speaker. Children in the Second Label conditions in Study 1, who interacted with either an ignorant or a knowledgeable speaker, were more likely to choose a familiar distracter as the referent for the novel label than children in

Study 2. In fact, over 75% of children in the Second Label Ignorant condition selected a familiar distracter on 1 or more test trials. Given that the objects were only referred to during the reliability period, and not explicitly labeled, it is possible that children in these conditions interpreted the task as one in which the speaker applies nonsense names to familiar objects. In contrast to the children in the Second Label conditions in Study 1, the children in Study 2, who interacted with an uncertain speaker, who provided labels during the Reliability Period, were more likely to refuse to choose any object as the referent for the novel label. Over half of the children in the Uncertain Accurate condition refused to select any object on at least 1 of the 2 test trials. This would indicate that they did not interpret the task as one of applying the novel label to a familiar object. One possible explanation is that they understood the nature of the task, but refused to interact with the experimenter who portrayed doubt while labeling objects that are commonly found in their environment. Children in the uncertain conditions had labeling information coupled with social cues to rely upon, while children in the knowledgeable and ignorant conditions did not have explicit labeling as an indicator of reliability. The combination of these cues may have caused more skepticism in their answer choices in the uncertain conditions. It is difficult to discern children's interpretations of the speaker, but these error pattern differences suggest that children treat the speakers in Study 1 and Study 2, and therefore the tasks, differently.

One important point to clarify is that these studies do not argue that children, by the age of 24 months, have a sophisticated understanding of the terms "think" and "know." Both studies paired these mental state terms with highly salient social cues that supported the statements being provided by the speaker. The combined understanding of social cues and phrasing information may have allowed children to form judgments about reliability at an early age.

The research presented in Study 1 and Study 2 sheds light upon the three questions posited in the introduction to this paper. The first question addressed whether children attend to speaker reliability cues using similar processes as those used to understand referential cues. It is the argument of this paper that children at an early age are attending to both the social and the verbal information in their environment when determining the relevance and reliability of information. Children are using both verbal and nonverbal behavior to determine a speaker's intentions when providing novel information. It could be that children expect a portion of the speaker's intentions to be the desire to provide accurate information. Children may have the assumption, this "default trust," that adults are accurate sources of information, which allows them early in language development to focus less on determining the reliability of individuals and attend more to the information being provided. When reliability cues are violated, whether by unreliable eye gaze behavior (Chow et al., 2008), inaccurate labeling (Birch et al. 2008; Jaswal & Malone, 2007; Koenig & Harris, 2005), or indications of ignorance (Koenig & Harris, 2005; Sabbagh et al., 2003), children must then adjust their behavior to account for this lack of credibility. In Chow et al.'s (2008) study, 14-month-old children were less willing to track the gaze of an unreliable looker. Children who are given the option to choose between a reliable and an unreliable speaker tend to rely on the speaker who provides accurate information (Koenig & Harris, 2005). Taken together, children from a young age are using information available in their environment, whether they are preverbal infants who rely on eye gaze or verbal children who attend to the accuracy of labels, to determine the reliability of the source of the information being presented.

The second question addressed in this dissertation focuses more specifically on the cues to the mental state of the speaker, which extends to more than just attending to the accuracy of the speaker's information. The present studies examined children's early

understanding that adults provide information about the extent of their knowledge through both explicit phrasing, as in "I don't know what that is," and social pragmatic information, such as tone of voice and facial expression. Young 2-year-old children were less willing to learn novel labels for familiar objects from a speaker who was previously ignorant about familiar objects than when the speaker was knowledgeable. Children were even willing to learn novel labels for familiar objects from a speaker who was doubtful about the accurate information being provided. However, when the speaker was doubtful and provided inaccurate information, children were more likely to reject the novel label being applied to the familiar object. The task presented here did not require children to form an in-depth understanding of the speaker's intentions, as in the Theory of Mind tasks with older children that typically ask children to predict the future behavior of others. In this task, children simply had to either accept or reject the novel information being presented, which may have allowed children to create superficial judgments about the credibility of the speaker. It is unknown whether children would generalize their judgments about the speaker's reliability across domains or even different speakers, but this would be an interesting area for future research.

The third question was the focus of much of the discussion presented in this paper. Children may rely on accurate and inaccurate labelers when they have no preexisting knowledge to contradict the information being presented. When they have previous knowledge, as in the case of second label learning, they may be more likely to weigh the risk of learning novel information from an unreliable source as detrimental to their current knowledge state. Instead, children may maintain the information that they currently hold and disregard new information provided by a source that does not appear credible. However, when the source of information complies with their general assumptions about reliable speakers, children may be more willing to update their current

knowledge to include the novel information. This argument is supported by Bergstrom et al.'s (2006) proposal that children evaluate information being provided by others to determine if it coincides with their previous knowledge. If the information is consistent with the children's current knowledge, then they easily incorporate it, but if the information contradicts their present knowledge, children must rely on factors, such as the reliability of the speaker, to determine the validity of the new information.

When young children experience an ambiguous labeling situation, such as a novel label being applied to a familiar object, they may rely on the referential cues of the speaker to clarify the referent of the label. When speaker reliability cues support the expectation that an adult provides accurate labels for objects, children are more willing to accept the label provided. However, when speaker reliability cues violate the social expectation that children have about adult labeling behavior, children may choose to rely on principles, such as Mutual Exclusivity, to infer appropriate labels. Referential intent cues, including the prior reliability of the speaker, could serve as a guide for children in understanding when to adhere to and when to override word-learning principles such as Mutual Exclusivity.

Previous research in language development has focused on the ability to determine the proper referent for a label from an infinite number of possibilities. However, language learners are not overwhelmed by this task; in fact, the ability to map labels onto objects appears almost effortless, even for young children. This ease of learning may result in part from the wealth of information that is available for identifying the appropriate label for an object. Speakers provide cues to their intentions in the form of both verbal and nonverbal behaviors that lead both the speaker and the listener to understand the goal of the interaction. The ability to interpret these contextual cues can aid in early learning of object labels. The present studies further investigated children's

understanding of contextual cues available from the speaker, such as reliability and mental state knowledge, which may aid children in either identifying the appropriate label for an object that is unfamiliar to them or understanding that a familiar object has multiple labels. These studies also focused on a younger age group than most current speaker reliability studies, using a method that reduces that amount of information children have to attend to during the task. This allows for conclusions to be made about the development of children's understanding of mental state cues during early word learning.

Children rely on others to provide information about their environment, but this does not just include linguistic information. They learn facts about the world, such as that the Earth is a planet, as well as abstract concepts, such as justice and moral values, that are not easily proven through their own experiences. Children will also have to navigate the often times hurtful realization that sometimes people provide inaccurate information for selfish purposes. Children rely on others to support and guide them as they gain a better understanding of themselves and their own knowledge. It is with this understanding that they become accurate sources of information as well.

Table 1.

*Frequency of children who chose exemplars on zero, one, or two test trials in the following categories: the target object (correct choice), a familiar distracter of the two that were present during test trials, or a novel object distracter that had not been given a label in Study 1. Within each category type, each participant's (of the 16 participants within each condition) object selection is accounted for.*

| | **Target Object** | **Familiar Distracter** | **Novel Distracter** | **Refuse to Choose** |
|---|---|---|---|---|
| | | *First Label Knowledgeable* | | |
| Number of items chosen | | | | |
| 0 | 3 | 15 | 11 | 11 |
| 1 | 9 | 1 | 5 | 3 |
| 2 | 4 | 0 | 0 | 2 |
| | | *First Label Ignorant* | | |
| Number of items chosen | | | | |
| 0 | 5 | 12 | 14 | 11 |
| 1 | 3 | 4 | 2 | 3 |
| 2 | 8 | 0 | 0 | 2 |
| | | *Second Label Knowledgeable* | | |
| Number of items chosen | | | | |
| 0 | 2 | 9 | 10 | 15 |
| 1 | 11 | 6 | 6 | 1 |
| 2 | 3 | 1 | 0 | 0 |
| | | *Second Label Ignorant* | | |
| Number of items chosen | | | | |
| 0 | 6 | 4 | 13 | 13 |
| 1 | 10 | 10 | 1 | 3 |
| 2 | 0 | 2 | 2 | 0 |

Table 2.

*Frequency of children who chose exemplars on zero, one or two test trials in the following categories: the target object (correct choice), a familiar distracter of the two that were present during test trials, or a novel object distracter that had not been given a label in Study 2. Within each category type, each participant's (of the 16 participants within each condition) object selection is accounted for.*

| | **Target Object** | **Familiar Distracter** | **Novel Distracter** | **Refuse to Choose** |
|---|---|---|---|---|
| | *Uncertain Accurate* | | | |
| Number of items chosen | | | | |
| 0 | 3 | 14 | 14 | 7 |
| 1 | 9 | 2 | 2 | 6 |
| 2 | 4 | 0 | 0 | 3 |
| | *Uncertain Inaccurate* | | | |
| Number of items chosen | | | | |
| 0 | 6 | 10 | 11 | 11 |
| 1 | 6 | 5 | 5 | 4 |
| 2 | 4 | 1 | 0 | 1 |

Table 3.

*Frequency of children who chose exemplars on zero, one, or two test trials in the following categories: the target object (correct choice), a familiar distracter of the two that were present during test trials, or a novel object distracter that had not been given a label in the Second Label conditions of Study1 and both conditions of Study 2. Within each category type, each participant's (of the 16 participants within each condition) object selection is accounted for.*

| | **Target Object** | **Familiar Distracter** | **Novel Distracter** | **Refuse to Choose** |
|---|---|---|---|---|
| | | *Second Label Knowledgeable* | | |
| Number of items chosen | | | | |
| 0 | 2 | 9 | 10 | 15 |
| 1 | 11 | 6 | 6 | 1 |
| 2 | 3 | 1 | 0 | 0 |
| | | *Second Label Ignorant* | | |
| Number of items chosen | | | | |
| 0 | 6 | 4 | 13 | 13 |
| 1 | 10 | 10 | 1 | 3 |
| 2 | 0 | 2 | 2 | 0 |
| | | *Uncertain Accurate* | | |
| Number of items chosen | | | | |
| 0 | 3 | 14 | 14 | 7 |
| 1 | 9 | 2 | 2 | 6 |
| 2 | 4 | 0 | 0 | 3 |
| | | *Uncertain Inaccurate* | | |
| Number of items chosen | | | | |
| 0 | 6 | 10 | 11 | 11 |
| 1 | 6 | 5 | 5 | 4 |
| 2 | 4 | 1 | 0 | 1 |

Figure 1.

*A schematic of the procedure for Study 1, including sample reliability period objects, as well as Novel Label trials and 1 sample test trial for both First and Second Label conditions.*

**Reliability Period (6 Trials):**

| | *Knowledgeable Labeling* | | *Ignorant Labeling* |
|---|---|---|---|
| Trial 1… | I know what that is. What's that? |  | I don't know what that is. What's that? |
| Trial 6 | I know what that is. What's that? |  | I don't know what that is. What's that? |

**Novel Label Trials (2 Trials):**

| | *First Label Conditions* | *Second Label Conditions* |
|---|---|---|
| Trial 1: | That's a gep  | That's a gep  |
| Trial 2: | That's a danu  | That's a danu  |

**Test Trial (2 Trials):**

***First Label Conditions (1 of 2 Trials):*** Where's a gep? Can you point to a gep?


Target


Familiar Distracter


Familiar Distracter


Novel Distracter

***Second Label Conditions (1 of 2 Trials):*** Where's a gep? Can you point to a gep?


Target


Familiar Distracter


Familiar Distracter


Novel Distracter

Figure 2.

*Means and standard errors for each condition in Study 1.*

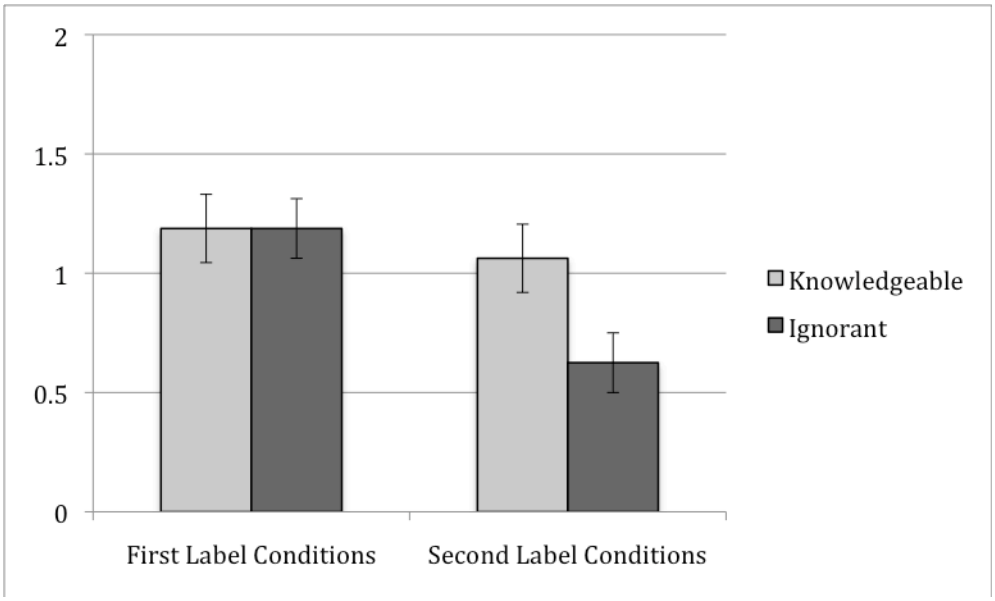


Figure 3.

*A schematic of the procedure for Study 2, including sample reliability period objects, as well as Novel Label trials and 1 sample test trial.*

**Reliability Period (6 Trials):**

| | *Uncertain Accurate Labeling* | | *Uncertain Inaccurate Labeling* |
|---|---|---|---|
| Trial 1… | I think that's a duck. What's that? |  | I think that's a car. What's that? |
| Trial 6 | I think that's a car. What's that? |  | I think that's a duck. What's that? |

**Novel Label Trials (2 Trials):**

Trial 1: That's a gep 

Trial 2: That's a danu 

**Test Trial-(2 Trials):**

Test Trial (1 of 2): Where's a gep? Can you point to a gep?

 Target

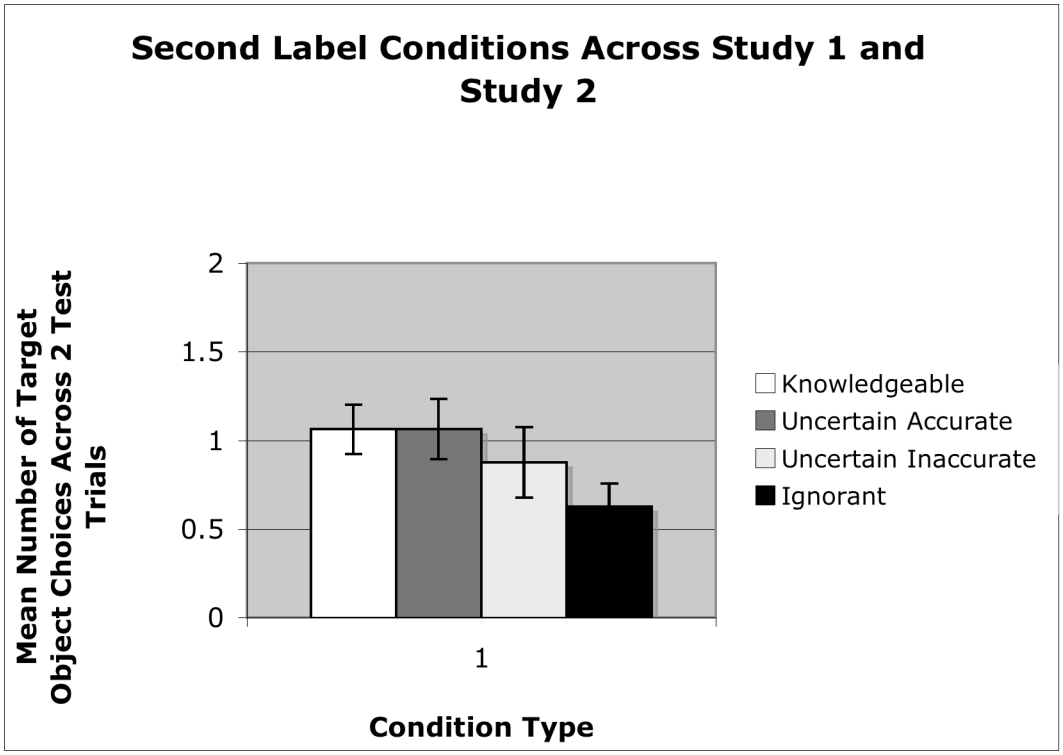
 Familiar Distracter

 Familiar Distracter

 Novel Distracter

Figure 4.

*Means and standard errors for each of the Second Label conditions across Study 1 and Study 2.*



Appendix A

# Vocabulary Checklist

Please indicate your child's comprehension of each of the following words by checking the appropriate box. If your family uses and alternate word to indicate an object (e.g. "kitty" for "cat") write that word in the space provided

| | Does Not Understand | May Understand | Definitely Understands | Understands and Says | Alternate Word |
|---|---|---|---|---|---|
| Airplane | □ | □ | □ | □ | _____ |
| Apple | □ | □ | □ | □ | _____ |
| Baby | □ | □ | □ | □ | _____ |
| Ball | □ | □ | □ | □ | _____ |
| Balloon | □ | □ | □ | □ | _____ |
| Banana | □ | □ | □ | □ | _____ |
| Bear | □ | □ | □ | □ | _____ |
| Bed | □ | □ | □ | □ | _____ |
| Bib | □ | □ | □ | □ | _____ |
| Bird | □ | □ | □ | □ | _____ |
| Blanket | □ | □ | □ | □ | _____ |
| Block | □ | □ | □ | □ | _____ |
| Boat | □ | □ | □ | □ | _____ |
| Book | □ | □ | □ | □ | _____ |
| Bottle | □ | □ | □ | □ | _____ |
| Car | □ | □ | □ | □ | _____ |
| Cat | □ | □ | □ | □ | _____ |
| Chair | □ | □ | □ | □ | _____ |
| Cheerios | □ | □ | □ | □ | _____ |
| Cookie | □ | □ | □ | □ | _____ |
| Cow | □ | □ | □ | □ | _____ |
| Cup | □ | □ | □ | □ | _____ |

| | Does Not Understand | May Understand | Definitely Understands | Understands and Says | Alternate Word |
|---|---|---|---|---|---|
| Dog | □ | □ | □ | □ | _____ |
| Duck | □ | □ | □ | □ | _____ |
| Fish | □ | □ | □ | □ | _____ |
| Flower | □ | □ | □ | □ | _____ |
| Frog | □ | □ | □ | □ | _____ |
| Hat | □ | □ | □ | □ | _____ |
| Horse | □ | □ | □ | □ | _____ |
| Monkey | □ | □ | □ | □ | _____ |
| Pacifier | □ | □ | □ | □ | _____ |
| Pear | □ | □ | □ | □ | _____ |
| Pig | □ | □ | □ | □ | _____ |
| Rabbit | □ | □ | □ | □ | _____ |
| Sheep | □ | □ | □ | □ | _____ |
| Shoe | □ | □ | □ | □ | _____ |
| Sock | □ | □ | □ | □ | _____ |
| Spoon | □ | □ | □ | □ | _____ |
| Stroller | □ | □ | □ | □ | _____ |
| Table | □ | □ | □ | □ | _____ |
| Train | □ | □ | □ | □ | _____ |
| Tree | □ | □ | □ | □ | _____ |
| Truck | □ | □ | □ | □ | _____ |

# Appendix B

## KNOWLEDGABLE LABELING-NOVEL OBJECT SCRIPT: CONDITION 1/CB2

1. I know what that is. What's that? I know what that is. What's that? I know what that is.

2. I know what that is. What's that? I know what that is. What's that? I know what that is.

3. I know what that is. What's that? I know what that is. What's that? I know what that is.

4. I know what that is. What's that? I know what that is. What's that? I know what that is.

5. I know what that is. What's that? I know what that is. What's that? I know what that is.

6. I know what that is. What's that? I know what that is. What's that? I know what that is.

7. That's a danu (top)

8. That's a gep (bird)

TEST ORDER:
Where's a danu? Can you point to a danu?

1. top _____. bell _____

Where's a gep? Can you point to a gep?

2. _____. fluff _____. bird

**IGNORANT LABELING-NOVEL OBJECT**

**SCRIPT: CONDITION 2/ CB1**

1. I don't know what that is. What's that? I don't know what that is. What's that? I don't know what that is.

2. I don't know what that is. What's that? I don't know what that is. What's that? I don't know what that is.

3. I don't know what that is. What's that? I don't know what that is. What's that? I don't know what that is.

4. I don't know what that is. What's that? I don't know what that is. What's that? I don't know what that is.

5. I don't know what that is. What's that? I don't know what that is. What's that? I don't know what that is.

6. I don't know what that is. What's that? I don't know what that is. What's that? I don't know what that is.

7. That's a gep (bell)

8. That's a danu (fluff)

TEST ORDER:
Where's a gep? Can you point to a gep?

1. _____. bell _____. top

Where's a danu? Can you point to a danu?

2. bird _____. fluff _____.

**KNOWLEDGABLE LABELING-FAMILIAR OBJECT**
**CONDITION 2/ CB2**

1. I know what that is. What's that? I know what that is. What's that? I know what that is.

2. I know what that is. What's that? I know what that is. What's that? I know what that is.

3. I know what that is. What's that? I know what that is. What's that? I know what that is.

4. I know what that is. What's that? I know what that is. What's that? I know what that is.

5. I know what that is. What's that? I know what that is. What's that? I know what that is.

6. I know what that is. What's that? I know what that is. What's that? I know what that is.

7. That's a danu (dog)

8. That's a gep (ball)

TEST ORDER:

Where's a danu? Can you point to a danu?

1. dog _____. fluff _____

Where's a gep? Can you point to a gep?

2. _____. bird _____. ball

**IGNORANT LABELING-FAMILIAR OBJECT**
**SCRIPT: CONDITION 1/ CB2**

1. I don't know what that is. What's that? I don't know what that is. What's that? I don't know what that is.

2. I don't know what that is. What's that? I don't know what that is. What's that? I don't know what that is.

3. I don't know what that is. What's that? I don't know what that is. What's that? I don't know what that is.

4. I don't know what that is. What's that? I don't know what that is. What's that? I don't know what that is.

5. I don't know what that is. What's that? I don't know what that is. What's that? I don't know what that is.

6. I don't know what that is. What's that? I don't know what that is. What's that? I don't know what that is.

7. That's a danu (ball)

8. That's a gep (dog)

TEST ORDER:

Where's a danu? Can you point to a danu?

1. ball _____. bell _____

Where's a gep? Can you point to a gep?

2. _____. top _____. dog

**UNCERTAIN ACCURATE**
**CONDITION 2/ CB1**

1. I think that's a _____. What's that? I think that's a _____. What's that? I think that's a _____.

2. I think that's a _____. What's that? I think that's a _____. What's that? I think that's a _____.

3. I think that's a _____. What's that? I think that's a _____. What's that? I think that's a _____.

4. I think that's a _____. What's that? I think that's a _____. What's that? I think that's a _____.

5. I think that's a _____. What's that? I think that's a _____. What's that? I think that's a _____.

6. I think that's a _____. What's that? I think that's a _____. What's that? I think that's a _____.

7. That's a gep (ball)

8. That's a danu (dog)

TEST ORDER:
Where's a gep? Can you point to a gep?

1. _____. ball _____. bird

Where's a danu? Can you point to a danu?

2. fluff _____. dog _____.

**UNCERTAIN INACCURATE**
**CONDITION 2/ CB1**

1. I think that's a _____. What's that? I think that's a _____. What's that? I think that's a _____.

2. I think that's a _____. What's that? I think that's a _____. What's that? I think that's a _____.

3. I think that's a _____. What's that? I think that's a _____. What's that? I think that's a _____.

4. I think that's a _____. What's that? I think that's a _____. What's that? I think that's a _____.

5. I think that's a _____. What's that? I think that's a _____. What's that? I think that's a _____.

6. I think that's a _____. What's that? I think that's a _____. What's that? I think that's a _____.

7. That's a gep (ball)

8. That's a danu (dog)

TEST ORDER:
Where's a gep? Can you point to a gep?

1. _____. ball _____. bird

Where's a danu? Can you point to a danu?

2. fluff _____. dog _____.

## References


Akhtar, N., Jipson, J., & Callanan, M. A. (2001). Learning words through overhearing. *Child Development, 72,* 416-430.

Au, T. K., & Glusman, M. (1990). The principle of mutual exclusivity in word learning: To honor or not to honor? *Child Development, 61,* 1474-1490.

Baldwin, D. (1993). Infants' ability to consult the speaker for clues to word reference. *Journal of Child Language, 20,* 395-418.

Baldwin, D. A., Markman, E. M., Bill, B, Desjardins, R. N., Irwin, J. M., & Tidball, G. (1996). Infants' reliance on a social criterion for establishing word-object relations. *Child Development, 67,* 3135-3153.

Bergstrom, B., Moehlmann, B., & Boyer, P. (2006). Extending the testimony problem: Evaluating the truth, scope, and source of cultural information. *Child Development, 77,* 531-538.

Birch, S. A. J. (2005). When knowledge is a curse: Children's and adults' reasoning about mental states. *Current Directions in Psychological Science, 14,* 25-29.

Birch, S. A. J. & Bloom, P. (2002). Preschoolers are sensitive to the speaker's knowledge when learning proper names. *Child Development, 73,* 434-444.

Birch, S. A. J. & Bloom, P. (2007). The curse of knowledge in reasoning about false beliefs. *Psychological Science, 18,* 382-386.

Birch, S. A. J., Vauthier, S. A., & Bloom, P. (2008). Three- and four-year-olds spontaneously use others' past performance to guide their learning. *Cognition,*

*107,* 1018-1034.

Bloom, P. (2000). How children learn the meanings of words. Cambridge, MA: MIT Press.

Callanan, M. A. & Sabbagh, M. A. (2004). Developmental multiple labels for objects in conversations with young children: Parents' language and children's developing expectations about word meanings. *Developmental Psychology, 40,* 746-763.

Campbell, A. L. & Namy, L. L. (2003). The role of social-referential context in verbal and nonverbal symbol learning. *Child Development, 74,* 549-563.

Chow, V., Poulin-Dubois, D., & Lewis, J. (2008). To see or not to see: Infants prefer to follow the gaze of a reliable looker. *Developmental Science, 11,* 761-770.

Clark, E. V. (1983). Meaning and concepts. In J. H. Flavell & E. M. Markman (Eds.), P. H. Mussen (Series Ed.), *Handbook of child psychology: Vol.* 3. *Cognitive development* (pp. 787-840). New York: Wiley.

Clark, E. V. (1987). The principle of contrast: A constraint on language acquisition. In B. Mac-Whinney (Ed.), *Mechanisms of language acquisition* (pp. 1-33). Hillsdale, NJ: Erlbaum.

Clark, E.V. (1988). On the logic of contrast. *Journal of Child Language*, 15, 317–335.

Clark, E.V. (1990). On the pragmatics of contrast. *Journal of Child Language,* 17, 417–431.

Clark, E.V. (1997). Conceptual perspective and lexical choice in acquisition. *Cognition*, 64, 1–37.

Clément, F., Koenig, M., & Harris, P. (2004). The ontogenesis of trust. *Mind &*

*Language, 19,* 360-379.

Corriveau, K. H., Fusaro, M., & Harris, P. L. (2009). Going with the flow: Preschoolers prefer nondissenters as informants. *Psychological Science, 20,* 372-377.

Davidson, D. & Tell, D. (2005). Monolingual and bilingual children's use of mutual exclusivity in the naming of whole objects. *Journal of Experimental Child Psychology*, *92,* 25-45.

Desrochers, S., Morissette, P., & Ricard, M. (1995). Two perspectives on pointing in infancy. In C. Moore & P. J Dunham (Eds.) *Joint attention: Its origins and role in development* (pp. 85-101). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Fenson, L., Dale, P., Reznick, S., Thal, D., Bates, E., Hartung, J., Pethick, S., & Reilly, J. (1993). MacArthur Communicative Development Inventories: User's guide and technical manual. San Diego: Singular Publishing Group, Inc.

Golinkoff, R., Mervis, C. B., & Hirsh-Pasek, K. (1994). Early object labels: The case for a developmental lexical principles framework. *Journal of Child Language,* 21,125–155.

Hogrefe, G. J., Wimmer, H., & Perner, J. (1986). Ignorance versus false belief: A developmental lag in attribution of epistemic states. *Child Development, 57,* 567-582.

Jaswal, V. K. (2004). Don't believe everything you hear: Preschoolers' sensitivity to speaker intent in category induction. *Child Development, 75,* 1871-1885.

Jaswal, V. K. & Hansen, M. B. (2006). Learning words: children disregard some pragmatic information that conflicts with mutual exclusivity. *Developmental*

*Science, 9,* 158-165.

Jaswal, V. K. & Malone, L. S. (2007). Turning believers into skeptics: 3-year-olds' sensitivity to cues to speaker credibility. *Journal of Cognition and Development, 8,* 263-283.

Jaswal, V. K. & Neely, L. A. (2006). Adults don't always know best: Preschoolers use past reliability over age when learning new words. *Psychological Science, 17,* 757-758.

Koenig, M. A., Clément, F., & Harris, P. L. (2004). Trust in testimony: Children's use of true and false statements. *Psychological Science, 15,* 694-698.

Koenig, M. & Echols, C. (2003). Infants' understanding of false labeling events: the referential roles of words and the speakers who use them. *Cognition, 87,* 179-208.

Koenig, M. A. & Harris, P. L. (2005). Preschoolers mistrust ignorant and inaccurate speakers. *Child Development, 76,* 1261-1277.

Koenig, M. A. & Harris, P. L. (2005). The role of social cognition in early trust. *Trends in Cognitive Sciences, 9,* 457-459.

Krogh-Jespersen, S., & Echols, C. H. (2009). *The influence of speaker reliability on first versus second label learning*. Manuscript submitted for publication.

Lee, K., Cameron, C. A., Doucette, J., & Talwar, V. (2002). Phantoms and fabrications: Young children's detection of implausible lies. *Child Development, 73,* 1688-1702.

Liittschwager, J. C. & Markman, E. M. (1994). Sixteen- and 24-month-olds' use of mutual exclusivity as a default assumption in second-label learning.

*Developmental Psychology, 30,* 955-968.

Markman, E. M. (1990). Constraints children place on word meanings. *Cognitive Science, 14,* 57-77.

Markman, E. M., Wasow, J. L., & Hansen, M. B. (2003). Use of the mutual exclusivity assumption by young word learners. *Cognitive Psychology, 47,* 241-275.

Markman, E. M., & Watchel, G. F. (1988). Children's use of mutual exclusivity to constrain the meanings of words. *Cognitive Psychology, 20,* 121-157.

Meltzoff, A. N. (1995). Understanding the intentions of others: Re-enactment of intended acts by 18-month-old children. *Developmental Psychology, 31,* 838-850.

Merriman, W. E. & Kutlesic, V. (1993). Bilingual and monolingual children's use of 2 lexical acquisition heuristics. *Applied Psycholinguistics*, 12, 229-249.

Merriman, W. E. & Stevenson, C. M. (1997). Restricting a familiar name in response to learning a new one: evidence for the mutual exclusivity bias in young two-year-olds. *Child Development, 68,* 211-228.

Mervis, C. B. & Bertrand, J. (1994). Acquisition of the novel name-nameless (N3C) principle. *Child Development,* 65, 1646-1662.

Mervis, C. B., Golinkoff, R. M., & Bertrand, J. (1994). Two-year-olds readily learn multiple labels for the same basic-level category. *Child Development, 65,* 1163-1177.

Nurmsoo, E., & Robinson, E. J. (2009). Children's trust in previously inaccurate informants who were well or poorly informed : When past errors can be excused. *Child Development, 80,* 23-27.

Olineck, K. M. & Poulin-Dubois, D. (2007). Imitation of intentional actions and internal state language in infancy predict preschool theory of mind skills. *European Journal of Developmental Psychology, 4,* 14-30.

Pasquini, E. S., Corriveau, K. H., Koenig, M., & Harris, P. L. (2007). Preschoolers monitor the relative accuracy of informants. *Developmental Psychology, 43,* 1216-1226.

Povinelli, D. J. & DeBlois, S. (1992). Young children's (Homo sapiens) understanding of knowledge formation in themselves and others. *Journal of Comparative Psychology, 106,* 228-238.

Pratt, M. W., Kerig, P., Cowan, P. A., & Cowan, C. P. (1988). Mothers and fathers teaching 3-year-olds: Authoritative parenting and adult scaffolding of young children's learning. *Developmental Psychology, 24,* 832-839.

Robinson, E. J. & Whitcombe, E. L. (2003). Children's suggestibility in relation to their understanding about sources of knowledge. *Child Development, 74,* 48-62.

Sabbagh, M. A. & Baldwin, D. A. (2001). Learning words from knowledgeable versus ignorant speakers: Links between preschoolers' theory of mind and semantic development. *Child Development, 72,* 1054-1070.

Sabbagh, M. A., Wdowiak, S. D., & Ottaway, J. M. (2003). Do word learners ignore ignorant speakers? *Journal of Child Language, 30,* 905-924.

Savage, S. L., & Au, T. K. (1996). What word learners do when input contradicts the mutual exclusivity assumption. *Child Development, 67,* 3120-3134.

Schafer, G., & Plunkett, K. (1998). Rapid word learning by fifteen-month-olds under

tightly controlled conditions. *Child Development, 69,* 309-320.

Sodian, B. & Thoermer, C. (2004). Infants' understanding of looking, pointing, and reaching as cues to goal-directed action. *Journal of Cognition and Development, 5,* 289-316.

Tomasello, M., & Carpenter, M. (2007). Shared intentionality. *Developmental Science, 10,* 121-125.

Tomasello, M., Carpenter, M., Call, J., Behne, T., Moll, H. (2005). Understanding and sharing intentions: The origins of cultural cognition. *Behavioral and Brain Sciences, 2,* 675-735.

Watson, A. C., Painter, K. M., & Bornstein, M. H. (2001). Longitudinal relations between 2-year-olds' language and 4-year-olds' theory of mind. *Journal of Cognition and Development, 2,* 449-457.

Wellman, H. M., Lopez-Duran, S., LaBounty, J., & Hamilton, B. (2008). Infant attention to intentional action predicts preschool theory of mind. *Developmental Psychology, 44,* 618-623.

Wood, D. J., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem-solving. *Journal of Child Psychology and Psychiatry, 17,* 89-100.

Woodward, A. L. & Markman, E. M. (1998). Early word learning. In W. Damon (Ed), Handbook of child psychology: Volume 2: Cognition, perception, and language. (pp. 371-420). Hoboken, NJ, US: John Wiley & Sons Inc.

Woodward, A. L., Markman, E. M., & Fitzsimmons, C. M. (1994). Rapid word learning in 13- and 18-month-olds. *Developmental Psychology, 30,* 553-566.

Yu, C., Ballard, D. H., & Aslin, R. N. (2005). The role of embodied intention in early lexical acquisition. *Cognitive Science: A Multidisciplinary Journal, 29,* 961-100.

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